

FINAL

ADDENDUM NO. 2
TO
SITE 14 SOUTH CORRECTIVE ACTION PLAN AND
ASSOCIATED WORK PLAN
FOR
UNDERGROUND STORAGE TANK INTEGRITY TESTING
AND ADDITIONAL SITE ASSESSMENT

FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA

Contract No.: N00011-02-D-0000
Task Order 0017
ECN BAFL 0000-0017-0000A.2



Prepared for:

ERDC PHE West
1400 Francis Road, Suite 200
San Diego, CA 92161

Prepared by:

Battelle

Environmental Restoration Department
500 King Avenue
Columbus, Ohio 43261

February 13, 2008

APPROVAL PAGE

FINAL

ADDENDUM NO. 2
TO
SITE 14 SOUTH CORRECTIVE ACTION PLAN AND
ASSOCIATED WORK PLAN
FOR
UNDERGROUND STORAGE TANK INTEGRITY TESTING
AND ADDITIONAL SITE ASSESSMENT
FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA

Contract No. N00011-01-D-0000
Task Order 0007
FOR BATT. 1000 0017 0000.1

February 10, 2000

Reside Project Manager _____ Date _____
Mr. Christine Zimmerman

Reside for Technical Advisor _____ Date _____
Mr. Thomas Williamson, P.E.

CONTENTS

FIGURES	19
TABLES	19
ABBREVIATIONS AND ACRONYMS	v
Section 1.0 INTRODUCTION	1
1.1 Scope of Work	1
1.2 Objectives	1
Section 2.0 BACKGROUND	3
2.1 General Site Description and Location	3
2.2 Geology and Hydrogeology	3
2.3 Current Site Status	3
2.3.1 Free-Phase Petroleum Hydrocarbons	4
2.3.2 Petroleum Hydrocarbons in Soil	4
2.3.3 Petroleum Hydrocarbons in Groundwater	4
Section 3.0 METHODOLOGY FOR LEFT AND PERLINE LEAK AND INTEGRITY TESTING	5
Section 4.0 GROUNDWATER MONITORING WELL INSTALLATION	7
4.1 Approach for Additional Site Assessment	7
4.2 Pre-Drilling Site Characterization Permitting	8
4.3 Drilling Methods	8
4.4 Soil Logging Procedures	8
4.5 Well Construction Procedures and Materials	8
4.6 Well Development Procedures	8
4.7 Disposal of Investigation-Related Waste	10
4.7.1 Solid Waste	10
4.7.2 Liquid Waste	10
4.8 Survey of Soil Storage and Groundwater Monitoring Wells	10
Section 5.0 GROUNDWATER MONITORING ACTIVITIES	11
5.1 Groundwater-Level Measurement Procedures	11
5.2 Well Pumping and Sampling Procedures	11
5.3 Groundwater Sample Collection	12
5.4 Field Quality Control Procedures	12
5.4.1 Field Duplicate Samples	12
5.4.2 Equipment Blank Flasks	12
5.4.3 Trip Blanks	12
5.4.4 Temperature Flasks	12
5.5 Integrity/Leak Detection Flasks	12
5.6 Decommissioning Procedures	13
5.7 Reporting Activities	13
5.7.1 Groundwater Monitoring Summary Report	13
5.7.2 Electronic Deliverables	13
Section 6.0 REFERENCES	14

FIGURES

- Figure 1 Site Location Map
Figure 2 Site Map
Figure 3 Detachable Construction of Caissons at Gwinfield Site Shared Drilling Post
Impacker Caisson and Monitoring
Figure 4 Illustration of the PILETEST[®] LST Load Testing Process
Figure 5 Illustration of the TLD - 3 Friction Load Testing Process
Figure 6 Proposed Locations for Installation of Additional Monitoring Wells and Quarterly Sampling Network
Figure 7 Typical Finish Grade Gwinfield Monitoring Well Construction
Figure 8 Project Schedule Showing the Submittal of the Gwinfield Monitoring Summary Report

TABLES

- Table 1 Monitoring Objectives and Construction Details for the Proposed Monitoring Wells
Table 2 Summary of Well Construction Details for Proposed and Existing Monitoring Wells at Modderfont Site 14 South
Table 3 Analytical Methods, Containers, Preservatives and Holding Times

ATTACHMENTS

- Attachment 1 Sampling and Analysis Plan
Attachment 2 Site Health and Safety Plan
Attachment 3 Contractor Quality Control Plan

ABBREVIATIONS AND ACRONYMS

AB	Assembly Ball
APP	Accident Prevention Plan
Bq	below ground surface
BT&K	business, technical, administrative, and total systems
BRAC	Basic Reorganization and Closure
CAP	Corrective Action Plan
CME	Control Mitigation Equipment
CQC	Contractor Quality Control
CSM	conceptual site model
DI	decayed
DO	dissolved oxygen
DOT	United States Department of Transportation
DQO	data quality objective
DYW	depth to water
EMAC	Environmental Multiple-Agency Control
ELL	environmental screening level
ETO	Event Orientation Identifier
FSP	Field Sampling Plan
FT&ENC	Foster Wheeler Environmental Corporation
ISA	below stem cap
LDW	landfill-derived waste
mm	millimeter
MTLE	metal-terrestrial-ecos
NAAD	North American Datum
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NTU	nephelometer turbidity unit
ORP	oxidation-reduction potential
POC	point of contact
PPE	personal protective equipment
PVC	polyvinyl chloride
QA/P	Quality Assurance Project Plan

RCRA	Resource Conservation and Recovery Act
ROSCC	Resident Officer in Charge of Construction
SAP	Sampling and Analysis Plan
SHSP	Site Health and Safety Plan
SHSO	Site Health and Safety Officer
SWQCR	Drain Water Resource Control Board
THH	total petroleum hydrocarbons
THH-S	total petroleum hydrocarbons extractable
THH-G	total petroleum hydrocarbons gasified or gasoline
THH-P	total petroleum hydrocarbons-petroleum
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds
VOC	volatile organic compound
WATS	Wastewater Aquifer Treatment System

Section 1.0: INTRODUCTION

The Navy is conducting environmental restoration activities at the former Naval Air Station (NAS) Moffett Field, Moffett Field, California (Figure 1). Site 14 South falls under this program, and is the focus of this document. Completion of all site activities involves the Navy, National Aeronautics and Space Administration (NASA), U.S. Environmental Protection Agency (U.S. EPA), and the Water Board.

1.1 Scope of Work

The purpose of this Addendum (Addendum No. 2) to the Final Site 14 South Corrective Action Plan (CAP) and Associated Work Plan, Former Naval Air Station Moffett Field, Contractor (Tetra Tech, Inc.: 2004a) is to describe the processes associated with leak and integrity testing of the existing underground storage tanks (USTs), as well as procedures for installation and sampling of additional groundwater monitoring wells. The Navy proposes to conduct four quarters of groundwater monitoring from the expanded well network at Moffett Field Site 14 South to better characterize groundwater impacts at the site. This work is being performed by Battelle for the Navy, Naval Command and Control (RFPAC)/Program Management Office West under a contract with the Naval Facilities Engineering Command (NAVFAC) Southwest under Environmental Policy Award Contract (EPAC) No. N00019-02-D-4000. Task Order No. 0017 at Site 14 South, Former NAS Moffett Field, California.

Attachment 1 of this document contains a Sampling and Analysis Plan (SAP) for the collection of aqueous samples related to groundwater monitoring at the site. The SAP contains information typically contained in a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). Attachment 2 contains a Site Health and Safety Plan (SHSP) and an Accident Prevention Plan (APP) for field activities described in the Work Plan. Attachment 3 provides a Contractor's safety Control (CCG) Plan for the effort.

1.2 Objectives

The objective of this effort is to install additional groundwater monitoring wells to be sampled along with selected existing wells to better characterize the lateral and vertical extent of dissolved phase petroleum hydrocarbon present in groundwater at the site. If the monitoring data suggest that a leak is present, then leak integrity and leak testing may be performed on the existing USTs and associated piping to determine if there is an ongoing source of petroleum hydrocarbon mass to the subsurface.

Site assessment activities were performed concurrently with an evaluation of corrective action alternatives for Site 14 South. The results of these activities were documented in the Final Site 14 South Corrective Action Plan (RFP) and Associated Work Plan, Former Naval Air Station, a Moffett Field subplan (Tetra Tech, Inc.: 2004a) and the addendum to Site 14 South Corrective Action Plan and Associated Work Plan (Tetra Tech, Inc.: 2004b). Based on an assessment of site conditions and concentrations of petroleum constituents in soil and groundwater, impacts characterized using a modified Risk Assessment was incorporated in the corrective action for the site. Initially, contaminant selection was achieved in the source area using this approach, however, no reported leachate of contaminant constituents were observed, as presented in the Draft Site 14 South Program Report (Tetra Tech, Inc.: 2006).

Based on a thorough review of available site data, it has been concluded that more data gaps still remain with respect to delineation of the dissolved phase groundwater plume. Therefore, the Navy

propose to perform additional site characterization activities (e.g., four quarters of groundwater monitoring) to fill these data gaps and develop an updated comprehensive conceptual site model (CSM). Following completion of the updated CSM, an alternative evaluation will be conducted to identify an appropriate alternative to address the dissolved phase gas and water plumes at Site 14. See also:

Section 3.0 BACKGROUND

This section provides a general description and historical information for Moffett Field Site 14 South. A detailed description of the surface topography, geology, and hydrogeology can be found in Section 3.0 of the Corrective Action Plan (CAP) (Tetra Tech, Inc. 2004a).

3.1 General Site Description and Location

Site 14 South is an *unattended* self service fuel station located south-east of the intersection of Gentry Road and Ellis Street at Moffett Field (Figures 1 and 2). The site is currently used as a motor vehicle refueling facility and contains two fuel dispensers, a small, newly-occupied attendant building (Building 101) and two 12,000-gallon, double-walled, fibreglass underground storage tanks (USTs) (Tank 70 containing kerosene fuel and Tank 71 containing unleaded aviation). The site measures approximately 1 acre and is almost entirely paved with asphalt or concrete.

The site previously contained two 5,000-gallon USTs (Tanks 15 and 20) which were removed in 1980. Tanks 15 and 20 were reportedly used to store unleaded gasoline and diesel fuel, respectively. A release was originally detected at the location when Tanks 15 and 20 were replaced in 1980. The two new USTs (Tanks 70 and 71) were installed adjacent to the location of the former USTs. The new USTs were connected to the fuel dispensers, with new product lines as a secondary containment tank. The newly replaced product piping was later removed and replaced with double-walled fibreglass piping in the late 1990s to early 2000. The new USTs and piping systems are active today (Tetra Tech, Inc. 2004a).

3.2 Geology and Hydrogeology

Groundwater underneath Moffett Field exists in four vertically-delineated aquifers: A, B, C and Deep. The A aquifer is the shallowest and is subdivided into upper A and lower A aquifer zones. Petroleum contamination at Site 14 South is only present in the upper A aquifer zone, based on the absence of contamination in samples collected from wells W04-1, W04-2, and W04-4 screened in the lower A aquifer zone (Tetra Tech, Inc. 2004). The upper A aquifer zone extends from the surface to approximately 35 feet below ground surface (bgs) in the area of Site 14 South.

The predominant lithology of the upper A aquifer (ranging from surface grade to approximately 25 feet bgs) at Site 14 South consists of fine-grained silt and clays. Disconformities, thin permeable sand and gravel paleochannels are also known to underlie Site 14 South (PTC Environmental Management, Inc. 1994). Past investigations have confirmed the presence of a sand paleochannel extending from approximately 15 to 20 ft bgs directly beneath Site 14 South.

The overall groundwater flow direction in the upper A aquifer zone is to the north, toward San Francisco Bay. Locally, groundwater flow at the site is to the north-eastward, with a gradient of approximately 0.0007 feet per foot (Pentac Technical Environmental Corporation (PTTEC) 2003). Water levels at the site vary seasonally, and recent measurements taken at Site 14 South ranged from approximately 4 to 7 feet bgs (Tetra Tech, Inc. 2004).

3.3 Current Site Status

The following subsections present a brief description of the current understanding of petroleum hydrocarbon present in the two-phase, soil, and groundwater at Moffett Field Site 14 South.

3.1.1 Free Phase Petroleum Hydrocarbons: Site characterization activities were performed in support of the Total Site 14 South Corrective Action Plan (TSPS Tech PFF Inc. 2004a). This included the installation of 20 temporary monitoring wells with screened intervals extending the top of the water table. Free product was not observed in any of the 20 temporary wells installed at the site. Additionally, free product has not been observed in any of the existing monitoring wells at the site.

3.1.2 Petroleum Hydrocarbons in Soil: Based on water level measurements documented during post-operation monitoring activities, the groundwater surface is present at approximately 4 feet bgs during the pump season (TSPS Tech SC Inc. 2008). Available data for volatile non-halogenated petroleum 0 to 4 feet bgs demonstrate infrequent occurrences of low levels of petroleum constituents. Specifically, total petroleum hydrocarbons-gaseous (TPH-G) increases and decreases have been detected at maximum concentrations of 0.01 mg/L and 0.01 mg/L, respectively in volatile non-halogenated (TSPS Tech PFF Inc. 2004a, 2004b). The maximum value for toluene was estimated by the analytical laboratory as indicated by the J quality.

Due to the lack of petroleum hydrocarbon constituents measured in the volatile non-halogenated and in the results of increases at Site 14 South.

3.1.3 Petroleum Hydrocarbons in Groundwater: Initialled Parties a request was reported in January 2005 as part of a corrective action for the site. Gas and water monitoring was conducted on a quarterly basis for one year. Monitoring activities consisted of collecting groundwater samples from seven wells at the site (EWM-2, EWM-3, W14-02, W14-11, W14-12, W14-13, W14-14, and W14-15) and analyzing samples for TPH-G, methyl-tertiary ether (MTBE), benzene, toluene, ethylbenzene and total xylene (BTEX). Of the seven wells sampled, detectable concentrations of BTEX and TPH-G were observed in EWM-3, W14-2, W14-11, and W14-13, as shown on Figure 3. MTBE was not detected in any monitoring wells sampled during post-operation monitoring activities.

The highest levels of petroleum constituents were seen in W14-2. Maximum detections of TPH-G and BTEX were observed during a sampling event in October 2004 at concentrations of 2,000 µg/L, 8,000 µg/L, 40 µg/L, 40 µg/L, and 120 µg/L, respectively.

Based on a thorough review of the available groundwater data for Site 14 South, there are lateral and vertical data gaps which the MRP proposes to address prior to development of a corrective action for the site, as well as a long-term approach for site management. Recommendations to address these potential data gaps are further described in Sections 4.0 and 5.0 of this document.

Section 1.0- METHODOLOGY FOR UST AND PIPELINE LEAK AND INTEGRITY TESTING

The date free product has not been observed during historical environmental activities at Site 14 South, and historic leak testing activities have indicated that the existing tanks are not leaking. However, the groundwater monitoring results will be evaluated to determine whether there may have continuing sources of hydrocarbon mass to the subsurface. If the results indicate that there may be a continuing source, USTs 70 and 71 may be tested.

In the event that leak testing is conducted, the Herry would use a commercially available leak testing system known as VACUTECT[®] to determine the integrity of the USTs at the site. The California Environmental Protection Agency-approved system (State Water Resources Control Board (SWRCB) 2007) characterizes the integrity of storage tank systems by monitoring for changes in pressure, acetone and/or liquid level (in the tank) when the system is subject to a vacuum. The system is versatile, allowing for the detection of leaks as well as the nature and location of the leak. In addition, the approach is certified to test USTs with varying levels of product, therefore pre-purging of the USTs is not required. Figure 4 illustrates the tank integrity testing process using the VACUTECT[®] methodology.

In general, all openings to the tank are sealed off and a mild vacuum is applied by drawing air out of the tank using a vacuum pump. The vacuum level is constantly monitored and maintained by the computer in the testing unit. While under vacuum, the VACUTECT[®] system monitors three specific parameters:

1. **Liquid Level:** The liquid level at the bottom of the tank is mass tested to a resolution of 0.5 millimeters (mm). An increase indicates that the water is being drawn through a leak.
2. **Sound:** The probe contains a hydrophone which listens for sounds. A bubbling sound indicates that air is being drawn in and bubbling up through the product. A whistling sound indicates that air is being drawn into the ullage space (empty top portion of the tank).
3. **Pressure:** The pressure in the tank is monitored to see if the tank is holding vacuum. A constant loss of vacuum indicates a leak.

For leak testing as just outlined every time associated with the USTs a TLD-1 pipeline leak detector will be utilized. The California EPA approved detection system (SWRCB 2007) is an effective method for detecting very small leaks. The system is based on the simple principle that liquid fuel does not evaporate when placed under pressure. To conduct the test, the pipeline is pressurized with product. If the line is leaking, the test apparatus measures the amount of liquid exiting the line through the leak and is able to determine a leak rate.

As illustrated in Figure 3, the TLD-1 test apparatus is attached to the line at the union underneath the wing. The line is then connected into the tester and a pressure of 1.5 times the operating pressure of the line is applied. The level of liquid is noted in the graduated cylinder of the test apparatus. Liquid level readings are then observed at ten minute intervals. This allows for an on-site calculation of a leak rate in liters per hour.

Data generated during UST and associated pipeline integrity testing at Site 14 South will be prepared in a summary report following the completion of field activities. Anyway no leaks are

detected, additional site characterization activities will be conducted as described in Sections 6.0 and 3.0 of the Addendum.

If tank testing is conducted, B+C will subcontract an experienced vendor to perform the UST and associated pipeline integrity testing. This vendor will be operating based on the requirements outlined in B+C's SPSF during the phase of the testing work. The Battelle site health and safety officer (SHSO) will ensure safety compliance of all subcontractors through the duration of field activities. A copy of Battelle's Site Health and Safety Plan (SHSP) is included as Attachment 2.

Section 5.6 GROUNDWATER MONITORING WELL INSTALLATION

5.7 Approach for Additional Site Assessment

Additional site assessment activities are required to adequately delineate the lateral and vertical extent of dissolved petroleum hydrocarbons in groundwater at Site 14 South. The results of the additional site assessment will be used to develop a comprehensive conceptual site model (CSM) which will be the basis for an appropriate corrective action to address the dissolved phase groundwater plume at the site.

Additional site assessment activities will include the installation of seven additional groundwater monitoring wells at the site. As part of well installation activities, each borehole will be screened for free product using an oil/water interface meter and a hooker will be used to visually observe whether a sheen is present on groundwater prior to the installation of each monitoring well. Two nested well pairs (i.e., deep and shallow) will be installed, one on the vicinity of the former underground storage tanks (USTs) to delineate the source area, and another approximately 50 ft downgradient of the former USTs to delineate the extent of the plume. In addition, these wells will be installed to define the outer plume extent, two of which will be located cross-gradient of each other to define the lateral extent and the other will be installed upgradient of the former USTs to define the upgradient extent. If elevated concentrations are observed in any of these three wells, then additional wells will be installed at a location "stepped out" from the original well. Figure 6 presents a site map illustrating the estimated extent of petroleum hydrocarbon constituents in groundwater as of January 2008, as well as proposed locations for additional groundwater monitoring wells. In addition, Table 3 presents a summary of the monitoring objectives and Table 2 presents a summary of well construction details for existing and proposed monitoring wells at Site 14 South. A total of 16 wells will be sampled quarterly for one year as part of additional site assessment activities.

MW 3, MW 4, and MW 5 will each be constructed with a 12 ft screen extending from 15 to 30 ft bgs which will screen for the zone of contamination where groundwater is being recovered. Each nested well pair will consist of a shallow well screened from 15 to 30 ft bgs and a deep well screened from 30 to 35 ft bgs to evaluate the potential for vertical distribution of petroleum hydrocarbons in groundwater. All shallow wells consist with the presence of the sandy petroleum present from 15 to 30 ft bgs. During deep well installation MW 4-1, MW 4-2, and MW 4-3 are screened between 30 and 35 ft bgs and horizontal trend to have shown that petroleum hydrocarbons are not present at this depth. Therefore, the proposed deep wells MW 5A-1D and MW 5A-2D will be screened at an intermediate depth (30 to 35 ft bgs) which is between shallow wells and the existing deep wells. All seven proposed monitoring wells consist of a top of screen structure that is below the top of the water table and therefore would not be suitable for monitoring free product. Conversely, free product has not been observed at the site. Additionally, all monitoring well boreholes will be tested for free-phase petroleum hydrocarbons prior to well installation. If free product is not observed during these activities, then there will be no need to monitor free product and all proposed wells will be installed based on the details presented in Table 2. If free product is observed in the borehole prior to well construction, then the top of the screen for all shallow monitoring wells will placed above the water table so that free product can be measured in shallow wells.

Soil samples will not be collected during this phase of the investigation, since historical data indicate that chemical concentrations in various monitoring wells are minimal, and do not exceed regulatory environmental screening levels (ECLs) designated by the Water Board (2007). Although several cases of soil ECLs have been reported as detected near wells at Site 14 South (Tetra Tech P/W, Inc. 2004a, 2004b), it appears that the conclusion was based on a comparison of soil ECLs to detected soils which is

not an appropriate comparison (Water Board, 2000). Consequently, future assessment and remediation approaches for Site 14 South will focus on procedures between the site does not present any issues related to contamination in values more scale.

The following subsections provide a down plan of the procedures that will be followed in the field prior to drilling and following the installation of additional ground-water monitoring wells which includes site clearance and permitting, drilling and soil logging, ground-water monitoring well construction and development, disposal of construction-derived waste (CDW), site cleanup, and ground-water monitoring.

4.2 Pre-Drilling Site Clearance and Permitting

An inspection will be conducted at Site 14 South to locate and identify underground utility structures, such as surface-mounted manholes, valve boxes, utility vaults, water boxes, surface water hydrants or supports or other named appearances. Detailed utility inspection will be performed by a private contractor. The contractors from each underground utility companies will be used to confirm or modify the proposed locations of additional ground-water monitoring wells. Utility clearance activities will be coordinated through the Resident Office-in-Charge of Construction (ROICC) within a MWD-4 Field. Well installation permits will be obtained from the County of Santa Clara, if necessary before drilling activities begin. Furthermore, a National Aeronautics and Space Administration (NASA) permit will also be obtained for any entrance activities conducted at the site. Acquisition of the NASA permit will be coordinated through the ROICC.

All stakeholders (i.e., NASA, Water Board and US EPA) will be notified of all drilling at least two weeks in advance of each duration to Site 14 South.

4.3 Drilling Methods

A C-19 licensed drilling contractor will be contracted to advance the soil borings for installation of ground-water monitoring wells. The contractor will have the appropriate current construction experience and training. A Central Mining Department (CMD) 75 mg with hollow stem auger (HSA) drilling capability will be used to advance and borings to a depth of approximately 25 feet bgs.

4.4 Soil Logging Procedures

An experienced field geologist under the supervision of a California-licensed geologist will perform drilling and soil logging. The field geologist will visually inspect, classify, and log the cuttings from intervals intended for well screens, according to the Unified Soil Classification System (USCS). Modified Soil Color Chart will also be used during soil logging activities.

A portable flame ionization detector (PID) will be used to monitor the soil over a monitoring area for volatile hydrocarbons. During drilling and sampling activities, the PID will be used to screen soil cuttings. Continuous response along the open boreholes will be maintained during the drilling process. The PID will be calibrated daily or when conditions warrant recalibration. The Site Health and Safety Plan (SHEP) presented in Attachment 2 will be followed for all well activities.

All soil cuttings removed from drilling activities will be placed in USF Department of Transportation (DOT)-approved 55-gallon drums or other suitable containers and stored at the site. All containers will be clearly labeled with the following information: date, project name and number, previous name, point of contact (POC), applicable contact numbers, contents of drum, and the boring

identification number. End cuttings will be disposed of in accordance with state and federal waste disposal requirements.

4.3 Well Construction Procedures and Materials

Groundwater monitoring wells will be installed and completed in five locations, as shown in Figures 4. Monitoring wells will be constructed of Schedule 40 polyvinyl chloride (PVC) casing and screens which are 2 inches in diameter. The screens will consist of 2 inch-diameter Schedule 40 PVC with 0.01 inch slots cut vertically at four slots per inch along the screen sections. The filter pack will consist of #20/30 silica sand placed to uniformly fill the annular space between the formation and the screen sections of the well.

The total depth of the monitoring wells will be approximately 35 feet bgs. (It is anticipated that either 5 or 35-foot screens (cased wells or stand alone wells, respectively) will be installed in each well and will vary in depth to further delineate the vertical distribution of p-nitrobenzene hydrocarbon in ground water (see Table 1). The screens may be installed in the field of site-specific monitoring systems modified construction designs. The top of the filter pack will be approximately 1 ft above the top of the screen. A transition sand will be set in the annular space around the well screen. The transition sand will consist of approximately 2 ft of medium to coarse clean sand placed on top of the filter pack. Potable water will be passed down the annulus to hydrate the bentonite to form a tight seal. The bentonite seal will be permitted to swell for approximately 30 minutes before the grout seal is installed. The remaining annular space will be backfilled with bentonite grout slurry to approximately 2 feet bgs. A concrete surface seal will be installed above the bentonite grout slurry to complete the well construction. A typical ground water monitoring well construction diagram is shown in Figure 7.

The monitoring wells will be completed with flush-mounted protective steel wells in areas of high traffic. The top of the PVC casing will be terminated at approximately 0.5 ft bgs and covered with a locking plug-top cap. All monitoring wells will be clearly marked and permanent identification tags with well numbers will be attached to the inside of the protective casing covers.

4.4 Well Development Procedures

Prior to installation of the well using materials, a partial development of the well will be performed to settle the filter pack material, minimizing the potential for subsidence and increasing the long-term reliability of the surface seal. Upon completion of the surface seal, a complete development of each new well will be performed following installation of the water table within the well. The static water level and initial pH, temperature, specific conductance and turbidity will be measured at the beginning of final development. Well development will be accomplished by first backing out accumulated groundwater near the well. The well screen then will be slowly surged. After backing and surging the well will be pumped with a peristaltic pump. A development proceeds the quantity of water removed from the well and the measurements of pH, temperature, specific conductance and turbidity will be measured on the well development (tail) by

Development will be considered complete when three consecutive measurements of pH, temperature, and specific conductance taken for every one-half benchhole volume (after the first benchhole volume was pumped) vary less than 10% and turbidity is 2 nephelometric turbidity units (NTUs) or less. A maximum of three benchhole volumes of water will be removed. In the event that a large tail amount of ground water exists at the site, the well will be surged and purged to dryness. Following water recovery in the well, the well will be surged and purged to dryness for a second time. Following the second round of surging and purging, development will be considered complete. Where predicted future well development will be collected and stored at the designated storage area for future disposal.

Existing wells that will be included in the monitoring network for quarterly sampling will be measured for total depth to determine whether significant elevation has occurred. Existing monitoring wells will be redeveloped as necessary based on the results of the total depth measurements.

4.7 Disposal of Ice Containers, Barrel Waste

This section describes the waste disposal procedures that will be followed during field activities.

4.7.1 Solid Waste. All field cuttings removed from individual boreholes will be placed directly into DOT-approved 55-gallon steel drums or metal kegs. The containers will be labeled with the following information: date, project name and number, generator name, POC name, applicable contact numbers, contents of drum, and the boring identification number. Empty containers will be labeled as such to avoid confusion. These containers will be stored in a suitable temporary storage area for no more than 60 days prior to disposal. The method of disposal will be determined based on historical analytical results from soil samples collected from borehole's boreholes.

Used personal protective equipment (PPE) generated during drilling and monitoring well installation and sampling activities will be placed in plastic bags and drums if visible evidence of contamination is observed. If sampling results indicate that benzene or chlorination and Petroleum Act (PCNA) is characteristic hazardous wastes exist, the PPE will be disposed of according to RCRA standards. Otherwise, the PPE will be disposed of as ordinary solid waste.

4.7.2 Liquid Waste. The equipment decontamination process will generate wastewater. In addition, wastewater will be produced from monitoring well development and groundwater sampling activities. Wastewater will be collected in drums and/or tanks. The drums/tanks will be labeled with the well number(s) and identity of collection, generator name, POC name, and the POC's phone number. Containers will be stored in a suitable temporary storage area. Empty containers will be labeled to avoid confusion. The method for wastewater disposal will be determined based on the groundwater analytical results from specific site monitoring wells. Wastewater will be transported off base and disposed of by a certified waste-handling contractor or will be disposed of at the Moffett Field Wastewater Treatment System (WWTSS) facility.

4.8 Survey of Well Strings and Groundwater Monitoring Wells

Groundwater monitoring wells and soil borings installed during the site assessment will be surveyed for the location and elevation of the piezometer casing, the water level, maximum reference point (i.e., top of the PVC casing) and the top of the protective steel casing. All surveying will be referenced to the nearest US datum for benchmarks located at Moffett Field. A reference point will be indicated on monitoring wells by a notch on a permanent mark on the casing. A qualified surveyor with and/or the supervision of a California licensed professional surveyor will perform surveying according to North American Datum (NAD) 1983 or US survey foot. Survey equipment will be calibrated in accordance with the manufacturer's recommendations.

Section 3.0: GROUNDWATER MONITORING ACTIVITIES

Following the approval of the ground-water monitoring well network at Site 14 South, a quarterly ground-water monitoring program will be initiated to analyze the spatial and temporal trends in ground-water quality, as well as to collect the information necessary for development of a robust conceptual site model (CSM). To complete this task, four quarters of ground-water sampling and analysis from the recommended ground-water monitoring well network (Figure 1) will be conducted as part of the additional site investigation activities. Groundwater monitoring procedures are described in the following subsections.

3.1 Groundwater Level Measurements and Procedures

As the well cover for each monitoring well is removed, the air in the breaching zone will be purged with a flame ionization detector (FID) or equivalent, to ensure that any volatile organic compounds (VOCs) do not pose an adverse health effect on the field sampling team. The instrument will be calibrated in accordance with the manufacturer's requirements. Calibration data will be recorded in an instrument log.

Groundwater level measurements will be taken from each monitoring well at a site before purging is initiated. The groundwater will be allowed to equilibrate with atmospheric conditions for approximately 3 minutes before taking water level measurements. A pressure reference mark will be located, or etched into the top of the casing to provide a consistent reference point from which all levels are measured. Depth to water (DTW) measurements will be taken to an accuracy of 0.01 ft using an ultrasonic interface probe. The ultrasonic interface probe will be disconnected to avoid cross contamination between wells. The measurements will be checked by slowly raising and lowering the probe and watching the instrument response. The measurement will be noted as in the field logbook.

3.2 Well Purging and Sampling Procedures

All monitoring wells at Site 14 South will be purged with a lift/lower pump using a low flow purging (recirculate) method. The objective of recirculating is to increase draw to the ground-water system by decreasing drawdown caused by pumping. Pumping at a low flow rate effectively isolates the screened interval from the purifying (integrated) casing water, therefore sampling water from the screened interval only. Typically flow rates on the order of 0.3 to 0.5 L/min are used during recirculating. The overall goal of recirculating is to maintain the drawdown within 0.10 m or 0.33 ft in the well during purging.

Following the initiation of purging, the water level in each well will be measured during drawdown to determine the most appropriate drawdown for this well. During purging, online water-quality parameters will be monitored continuously on a flow-through cell with a HANNA™ HI 9141 (or similar) water level monitor, and water quality parameter measurements should be taken every 3 to 5 minutes. Stabilization is achieved after three consecutive readings within:

- ± 0.2 m/s for pH
- ± 0.01 V for oxidation-reduction potential (ORP)
- ± 0.2 mg/L for dissolved oxygen (DO)
- $\pm 0\%$ of reading $\pm 0.2^{\circ}\text{C}$ for temperature
- ± 2 to 5% of reading for conductivity

3.3 Groundwater Sample Collection

Upon parameter identification, sampling will be initiated. To collect representative ground water samples, the in-line water quality parameter monitor device for sample collection will be disconnected or bypassed. The sample flow rate will be adjusted to maximize suction, inhibit formation, turbulent taking of sample by the or less of volatilization to extended residence time in tubing. At each site, sampling will occur from the least to most contaminated well, if known. Samples will be collected in approved sample containers for the appropriate type of analysis to be performed. Table 3 lists sampling methods and the appropriate sample containers, holding times, and preservation techniques associated with each method. After the sample container has been filled with groundwater a "Teflon"™ liner cap will be secured on tightly to prevent the container from leaking. Groundwater sampling proposed as part of site-based site characterization activities will follow procedures outlined in the SAP presented in Attachment 1 of this Work Plan.

3.4 Field Quality Control Procedures

Field quality control procedures will be implemented to ensure the representative nature of samples and to ensure that cross-contamination does not occur during sample acquisition, handling, or transportation.

3.4.1 Field Duplicate Samples. Field duplicate samples will be collected at a rate of 10% of the total number of ground water samples during each ground water sampling event. For all site samples, duplicate samples will be collected by obtaining two separate samples from the sampling device.

3.4.2 Equipment Rinse-Blanks. Equipment Rinse-Blanks will be collected daily during ground water sampling to ensure that nondesired sampling devices have been disconnected effectively. Equipment Rinse-Blanks will consist of the same water used in the final step of the sampling equipment decontamination procedure. Rinse samples will be collected at a frequency of once per day during ground water sampling events and will be analyzed for total petroleum hydrocarbons extractable (TPHE), total petroleum hydrocarbons quantifiable in gasoline (TPH(C)), and VOCs.

3.4.3 Trip Blanks. Trip Blank samples will accompany each cooler containing groundwater samples. They will be prepared at the analytical laboratory by filling volatile organic analytes (VOCs) vials with deionized (DI) water. Trip blanks will not be opened in the field and will be analyzed for VOCs. Trip blanks indicate whether the field samples have been contaminated during storage and shipping. The results of the trip blank analyses will be used to evaluate the field sample data in a manner consistent with the project data quality objectives (DQOs).

3.4.4 Temperature Blanks. Temperature blank samples will accompany each cooler containing samples with a temperature measurement requirement. The temperature blank will be prepared either by the analytical laboratory or the field sampling crew by filling VOCs vials with DI water. The temperature of the samples will be verified upon arrival at the analytical laboratory using the temperature blank.

3.5 Investigation-Derived Wastes

Investigation-derived wastes (IDW) will be disposed of as described in Section 4.7.

3.0 Decontamination Procedures

Decontamination will be a four-step process completed on all field equipment to avoid cross-contamination between samples and to ensure the health and safety of field personnel. Decontamination water will be collected in an appropriate container and disposed of according to Section 4.7. The following sequence will be used to clean equipment and sampling devices prior to and between each use:

- Rinse with potable water
- Wash with Lysol™ disinfectant, tap water and clean with a stiff bristle brush.
- Rinse three times with DI water
- Rinse with isopropyl-grade ethanol
- Place the sampling equipment on a clean surface and air-dry

3.1 Reporting Activities

Reporting activities for Site 14 South have been summarized in the following subsection:

3.1.1 Groundwater Monitoring Summary Report. The groundwater monitoring summary report will provide a summary of the results of groundwater testing activities at the site. This will include a discussion of the general water chemistry and the local groundwater flow patterns as well as any vertical gradients that may have been observed in the drilled well pore. Groundwater chemistry data will be used to generate a potentiometric surface that will be incorporated into the three-dimensional conceptual site model (CSM).

VOC concentrations will be summarized graphically and compared to the criterion screening levels (i.e., San Francisco Water Board environmental screening levels (ESLs) for potential hazardous substances). Graphics will include two dimensional concentration contours for benzene and other VOCs if appropriate for both a plan view and a cross-sectional view of the site. In addition, the concentration contours for benzene will be incorporated into the three-dimensional CSM of Site 14 South.

The report will also include additional integrative discussion of the chemical data and will identify needed action objectives and remediation goals (RGOs) which will be developed in close coordination with the California Water Board. Lastly, the report will include conclusions and a recommended path forward for future activities at Site 14 South. Figure 8 presents a project schedule during the submission of the Groundwater Monitoring Summary Report.

3.1.2 Electronic Data Upload. Results from the additional site characterization activities (including groundwater monitoring well installation and sampling) will be uploaded into Water Board's electronic database (referred to as the Geographical Environmental Information Management System [GeoTracker]) in accord with Water Board Assembly Bill (AB) 2000.

Section 5.6: REFERENCES

- Foster Wheeler Environmental Corporation (FWENC). 2000. *Final 1994 Arsenal Groundwater Report for WAFB and SACTs*. Former NAS Moffett Field, Moffett Field, California. September 20
- FRC Environmental Management, Inc. 1994. *Site 14 South Production Report Draft Final*. December 19
- State Water Resources Control Board (SWRCB). 2007. UST Program LG 153. Available at http://www.swrcb.ca.gov/efiled_documents/071206rdr.html
- Telm Tech EG, Inc. 2006. *Draft Site 14 South Production Report*. Prepared for Plant Management and Closure Program Management Office. October 1
- Telm Tech EM, Inc. 2001. *Site 14 South Groundwater Contamination*. Moffett Field Airfield, California. October 15
- Telm Tech PW, Inc. 2004a. *Final Site 14 South Corrective Action Plan (CAP) and Associated Work Plan*. Former Naval Air Station Moffett Field, California. Prepared for Naval Facilities Engineering Command Southwest Division. May 20
- Telm Tech PW, Inc. 2004b. *Addendum to Site 14 South Corrective Action Plan and Associated Work Plan*. Prepared for Naval Facilities Engineering Command Southwest Division. October 1
- Water Board. 2007. *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater*. November

FILE NUMBER



Figure 1. Site Location Map



Page 2 of 4

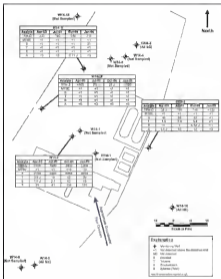


Figure 3. Estimable Concentrations of Chemicals in Groundwater Observed During Field-based Groundwater Monitoring

The Vacutect System

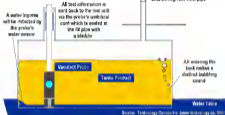


Figure 4. Illustration of the VACUTECT® DST Leak Testing Process

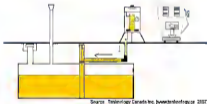


Figure 5. Illustration of the TLD 1 Product Line Leak Testing Process

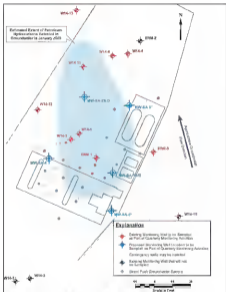
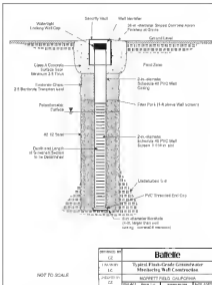


Figure 8. Proposed Localized Installation of Additional Monitoring Wells and Quarterly Sampling Network.



TABLES

Table 2 Monitoring Objectives and Construction Details for the Proposed Monitoring Wells

Location	Well ID#	Monitoring Objective	Well Construction Detail
Source Area	■ MW SA 15/3	Determine the aqueous concentrations and vertical distribution of total polychlorinated biphenyls (TPB-C), total polychlorinated biphenyls (quadrant) or quadrants (TPB-Q) and volatile organic compounds (VOCs) in the source area i.e. the vicinity of the former LRTS which are the likely source of the identified and/or suspected leak at Site 14 South.	With the deep and shallow nested well, pore will consist of 2 inch polyvinyl chloride (PVC) pipe flush mounted at the ground surface. The shallow well will be screened from 15 to 20 ft and the deep well will be screened from 20 to 30 ft bgs.
Conduit Area	■ MW SA 25/3	Determine the aqueous concentrations and vertical distribution of TPB-C, TPB-Q and VOCs along the corridor of the groundwater plume at Site 14 South.	With the deep and shallow nested well, pore will consist of 2 inch PVC pipe flush mounted at the ground surface. The shallow well will be screened from 15 to 20 ft bgs and the deep well will be screened from 20 to 30 ft bgs.
Lateral Extent ^a	■ MW SA 3 ■ MW SA 4	Define the lateral extent of TPB-C, TPB-Q and VOCs as groundwater by collecting groundwater samples that are either near or at low levels for these constituents.	Monitoring wells will consist of 2 inch PVC pipe flush mounted at the ground surface screened from 15 to 20 ft bgs.
Upgradient Extent ^b	■ MW SA 5	Define the upgradient extent of TPB-C, TPB-Q and VOCs as groundwater by collecting groundwater samples that are either near or at low levels for these constituents.	Monitoring well will consist of 2 inch PVC pipe flush mounted at the ground surface screened from 15 to 20 ft bgs.

- ^a If desired, levels of TPB-C, TPB-Q and/or VOCs can also be set for the proposed monitoring well. One of lateral monitoring wells may be installed in a location suggested on the conceptual well 15 well with the idea and detectors will be considered a monitoring monitoring well and will be used to detect aqueous concentrations along the corridor of the plume.

Table 2. Summary of Well Construction Details for Proposed and Existing Monitoring Wells at Moffat Field Site 14 North

Well ID	Increased Interval (ft log)		Total Depth (ft log)	Data Source
	Top	Bottom		
Existing Wells				
SSM-1*	Interval data not available			
SSM-2	14	13	25-26"	(3)
SSM-3	14	21	25-26"	(3)
WT-6-1*	40	40	26-27	(3)
WT-6-2*	15	25	24-25"	(1) & (2)
WT-6-3	15	20	25-26"	(3)
WT-6-4*	20	20	26	(3)
WT-6-5	25	20	26-27	(2)
WT-6-6*	30	33	27-28	(3)
WT-6-10	15	20	26-27"	(3)
WT-6-11*	8	20	25-26"	(2)
WT-6-12*	10	20	14-25"	(1) & (2)
WT-6-13*	15	20	13-15	(2)
Proposed Wells				
MW-Sa-1D*	20	25	25	MA
MW-Sa-1B*	10	20	20	MA
MW-Sa-2D*	20	25	25	MA
MW-Sa-2B*	10	20	20	MA
MW-Sa-3*	15	20	20	MA
MW-Sa-4*	10	20	20	MA
MW-Sa-5*	15	20	20	MA

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

100

[illegible]

DOI: 10.1002/anie.201000110 | www.angewandte.de | Accepted Manuscript

(d) This need level was assessed as one of the highest, based on extensive work with the first two studies, as well as the fact that the literature has shown that the increased health risk of not working in the health care of the community-related sector increases the need for social and health care services. In the community-related sector, the need for social and health care services was assessed as one of the highest.

Table 3. Analytical Methods, Containers, Preservatives, and Holding Times

Matrix	Analytical Group	Analytical and Preparation Method	Containers (no. used, size, type)	Preservatives (no. used, preservative, size)	Holding Time (preparation/analysis)
CW	TPH-C	EPA SW 846 8015B	2-40 mL glass vials	pH2 1:1 HCl, Cool, 4-40 °C	Extract within 14 days; analysis within 60 days of extraction
CW	TPH-C	EPA SW 846 8015B	2-40 mL glass vials	pH2 1:1 HCl, Cool, 4-40 °C	Extract/SA within 14 days
CW	VOCs	EPA SW 846 8260B	2-40 mL glass vials	pH2 1:1 HCl, Cool, 4-40 °C	Analysis within 14 days

ATTACHMENT 1

FINAL

**SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)
FOR ADDENDUM NO. 2 TO SITE 14 SOUTH CORRECTIVE ACTION
PLAN AND ASSOCIATED WORK PLAN FOR UNDERGROUND
STORAGE TANK INTEGRITY TESTING AND ADDITIONAL SITE
ASSESSMENT**

**FORMER NAVAL AIR STATION MOFFETT FIELD, D,
MOFFETT FIELD, CALIFORNIA**

**Contract No.: D00701 01 D 0100
Task Order No.: 0010
DCR: SA-71 000 0010 0002**

Prepared for

**ERAC PMO West
1400 Francis Blvd., Suite 600
San Diego, CA 92161**

Prepared by

**Battelle Memorial Institute
Environmental Restoration Department
945 King Avenue
Columbus, Ohio 43201**

February 2000

FINAL

SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)
FOR ADDENDUM NO. 2 TO SITE 14 SOUTH CORRECTIVE ACTION
PLAN AND ASSOCIATED WORK PLAN FOR UNDERGROUND
STORAGE TANK INTEGRITY TESTING AND ADDITIONAL SITE
ASSESSMENT

FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA

Contract No. N00115-00-D-4009
Task Order No. 0017
BCN- EATL-0009-0017-000

February 2008

Boats-to Program OC Manager
Ms. Denny Cuzak



2/7/08
Date

U.S. Navy QA Officer
Mr. Marcino Assoc.



2/7/2008
Date

Elements of the UFP QAPP and EPA QAPP in Relation to the SAP


UFP-QAPP Worksheet	EPA QAPP 5	This SAP	Variances from UFP-QAPP
A0 Title and Approval Page	A0 Title and Approval Page	Title and Approval Page	
A0 QAPP Identifying Information	Elements of UFP-QAPP Title	Section 1.0 Project Management and Structure	
A0 Distribution List	A0 Distribution List	Distribution List	
A0 Project Personnel Page Off Sheet	A0 Project Task Organization	Table 1.1 Project Personnel Page Off Sheet	
A0 Project Organization Chart	A0 Project Task Organization	Figure 1.1 Project Organization Chart	
A0 Communication Pathways	A0 Project Task Organization	Table 1.1 Communication Pathways	
A0 Personnel Responsibilities Matrix of Quality Plan - Table	A0 Project Task Organization	Table 1.2 Project Personnel and Responsibilities Matrix	
A0 Special Personnel Training Requirements Table	A0 "Personnel Training/Certification"	Section 1.3 Special Training/Certification	
A0 Project Sampling Timeline/Programmatic Sheet	A0 Problem Definition/Background		This SAP was developed by the Project Manager in conjunction with the Statewide Southwest TQM and team in order to ensure an on-call, telephone and faxable process for sampling requests as described in the UFP-QAPP manual, which was completed.
A0 Problem Definition	A0 Problem Definition/Background	Section 1.3 Problem Definition/Background	
A0 Project Quality Objectives/Programmatic Planning Review Data map	A0 Quality Objectives and Goals	Section 1.4 Quality Objectives and Goals for Measurement Data	
A0 Measurement References Criteria Table	A0 Quality Objectives and Goals	Table 1.4 Measurement References Criteria - Field QC Samples	
A0 Secondary Data Criteria and Location Table	A0 Problem Definition/Background	Section 1.3.2 Secondary Data	
A0 Summary of Project Tasks	A0 Project Task Description	Section 1.6 Project Task Description	
A0 Reference Limits and Evaluation Table	A0 Quality Objectives and Goals	Table 1.4 Reference Limits - Background	
A0 Project Schedule Timeline Table	A0 Project Task Description	Section 1.6 Project Task Description	
A0 Sampling Design and Methods	A0 Sampling Process Design	Section 2.1 Sampling Process Design	
A0 Sampling Locations and Methods SOP Requirement Table	A0 Sampling Methods	Table 2.2 Sampling Locations/Off, Sample Depth, Sample Analysis and Sample Definitions	
A0 Analytical SOP Requirement Table	A0 Analytical Methods	Table 2.3 Analytical Methods Containers, Measurements and Holding Time	
A0 Field Quality Control Sample Summary Table	A0 Quality Control	Table 2.4 Field Quality Control Sample Summary	
A0 Project Sampling SOP Reference Table	A0 Sampling Methods	Section 2.2 Sampling Methods	

Elements of the UFP-QAPP and EPA QA/R-3 in Relation to this SAP (Continued)

UFP-QAPP Worksheet	EPA QA/R-3	This SAP	Variances from UFP-QAPP
#11 Field Equipment Calibration, Maintenance, Testing, and Inspection Table	#6 Instrument/Equipment Testing, Inspection and Maintenance #7 Instrument/Equipment Calibration and Frequency	Table 2 Field Equipment Calibration, Maintenance, Testing and Inspection	
#21 Analytical SOP Reference Table	#4 Analytical Methods	Section 2.2.2 Laboratory Analytical Methods	
#24 Analytical Instrument Calibration Table	#6 Instrument/Equipment Testing, Inspection and Maintenance #7 Instrument/Equipment Calibration and Frequency	Section 2.2.3 Instrument/Equipment Calibration and Frequency	
#31 Analytical Instrument and Equipment Calibration, Maintenance, Testing, and Inspection Table	#7 Instrument/Equipment Testing, Inspection and Maintenance #7 Instrument/Equipment Calibration and Frequency	Section 2.2.4 Instrument/Equipment Testing, Inspection and Maintenance	
#35 Sampling Assembly System	#7 Sample Handling and Control	Section 2.3.1 Sample Packaging and Storage	
#37 Sample Custody Requirements	#7 Sample Handling and Control	Section 2.3.4 Sample Custody	
#38 QC Sample Table	#7 Quality Control	Section 2.3.5 Quality Control Requirements	
#39 Project Documents and Reports Table	#8 Documents and Records	Table 1-6 Project Documents and Reports	
#40 Analytical Services Table	#4 Analytical Methods	Section 2.5 Analytical Services	
#41 Project/Project Assessment Table	C1 Assessments and Response Actions	Section 3.1.1 Field Assessments and Section 3.1.2 Laboratory Assessments	
#42 Assessment Findings and Response Actions	F1 Assessment and Response Actions	Section 3.1.3 Corrective Action	
#51 QA Management Reports Table	#12 Data Management	Section 3.2.1 Data Management	
#54 Sampling and Analysis Verification (Steps 1) Process Table	D3 Verification and Validation Methods	Table 4.1 Verification Process	
#55 Sampling and Analysis Verification (Steps 2a and 2b) Process Table	D3 Verification and Validation Methods	Table 4.2 Verification Steps 2a and 2b Process	
#56 Sampling and Analysis Verification (Steps 2c and 2d) Process Table	D3 Data Review Verification and Validation	Table 4.3 Verification Steps 2c and 2d Process	
#61 Data Quality Assessment	D1 Data Collection with Data Assessments	Section 3.3 Data Quality Assessment	

I certify that this SAP is in compliance with the latest version of the UFP-QAPP and the EPA QA/R-3

Brian A. Linn
 Print Name (Rudolf Project/QC Manager)

 2/7/08
 Signature Date

DISTRIBUTION LIST
(OFF QAPP Worksheet #2)

QAPP Assignments	Title	Organization	Telephone Number	E-mail Address
Plan Approval	U.S. Navy Quality Assurance Officer (QAQ)	U.S. Navy, NAVFAC Southwest	(408) 532 3243	naac-naac@navy.mil
Witness Director	U.S. Navy Personnel Support Manager (PSM)	U.S. Navy, NAVFAC Southwest	(408) 532 9716	witness-director@navy.mil
Reg. Maintenance	Naval Field PMOCC	Naval Field PMOCC Office	(408) 423 9134	guy.mccormack@navy.mil
Naval R. South	Construction Management Tech	PMOCC Naval Field Airfield	(408) 423 9134	naval.r.south@navy.mil
Client Communication	Naval Project Manager	Naval	(404) 434 3179	communication@naval.mil
Elizabeth E. Wells	Water Resource Control Engineer	PMOCC	(408) 423 3148	EWells@naval.mil
Alana Lee	U.S. EPA, Project Manager	EPA, Region 9	(415) 972 3140	Lee.Alana@epa.gov
Thomas Williamson	Naval Project Technical Adviser	Naval	(404) 434 4794	williamson@naval.mil
Pyun Woorik	Naval Project Engineer/Project Quality Control Manager	Naval	(404) 434 3980 (404) 379 3179 (naval)	wwoorik@naval.mil
Project Inquiry	Naval Field Training/Operations Planning and Safety Office	Naval	(404) 434 3148 (404) 379 3311 (naval)	guseryn@naval.mil
Pring Colan	Naval Program QC Manager	Naval	(404) 434 4199	colan@naval.mil

CONTENTS

Elements of the UST QAPP and EPA QAPP in Relation to this QAP	iii
DISTRIBUTION LIST (UST QAPP Worksheet.02)	iv
FIGURES	viii
TABLES	xiii
ABBREVIATIONS AND ACRONYMS	ix
Section 1.0 PROJECT MANAGEMENT	11
1.1 Title and Approval Page	11
1.2 Table of Contents	11
1.3 Distribution List	11
1.4 Project Organization and Responsibilities	12
1.5 Project Definition/Background	12
1.6 Project/Field Descriptions	12
1.7 Quality Objectives and Criteria for Measurement Data	12
1.7.1 Data Quality Objectives	12
1.7.2 Quantitative Objectives: Precision, Accuracy, Completeness and Consistency	12
1.7.3 Qualitative Objectives: Comparability and Representativeness	14
1.8 Special Testing/Validation	14
1.9 Documentation and Records	15
Section 2.0 FIELD SAMPLING PLAN (DATA GENERATION AND ACQUISITION)	16
2.1 Sampling Process Overview	16
2.2 Procedures for UST Leak and Integrity Testing	16
2.3 Sampling Methods	17
2.3.1 Well Installation	17
2.3.2 Groundwater Sampling Procedures	18
2.3.2.1 Groundwater Level Measurement Procedures	18
2.3.2.2 Well Parging and Sampling Procedures	19
2.3.2.3 Groundwater Sample Collection	19
2.3.3 Investigation Ground Water	19
2.3.3.1 Solid Waste	19
2.3.3.2 Liquid Waste	20
2.3.4 Decontamination Procedures	20
2.3.5 Field Corrective Action	20
2.4 Sample Handling and Control	20
2.4.1 Sample Containers, Preservation and Holding Time	20
2.4.2 Sample Monitoring	20
2.4.3 Sample Labeling	20
2.4.4 Sample Control	21
2.4.5 Sample Packing and Shipment	21
2.4.6 Field Documents and Records	22
2.5 Analytical Services	22
2.5.1 Laboratory Selection	22
2.5.2 Laboratory Analytical Methods	22
2.5.3 Quantitative Reporting Limits	22
2.6 Quality Control Requirements	22
2.6.1 Field Quality Control	22
2.6.1.1 Field Duplicate Samples	22
2.6.1.2 Equipment Source Blank	22

2.4.1.1	Stop Wastes	24
2.4.1.2	Source Wastes	24
2.4.1.3	Intermediate Wastes	24
2.4.2	Laboratory Quality Control	24
2.4.2.1	Laboratory Control Samples	24
2.4.2.2	Laboratory Duplicate	24
2.4.2.3	Matrix Spike	24
2.4.2.4	Surrogate Standards	25
2.4.2.5	Internal Standards	25
2.4.2.6	Method Blank	25
2.5	Instrument/Equipment Testing, Inspection, and Maintenance	25
2.6	Instrument/Equipment Calibration and Proficiency	26
2.7	Impacts/Avoidance of Supplier and Contractor	26
2.10	Secondary Data	27
2.11	Data Management	27
2.11.1	Data Recording	27
2.11.2	Data Reduction	27
2.11.3	Data Reporting	28
2.11.4	Electronic Datatransfer	28
Section 3.0	ASSESSMENT/VERIFICATION	30
3.1	Assessment and Performance Actions	30
3.1.1	Field Assessment	30
3.1.2	Laboratory Assessment	30
3.1.3	Compliance Action	30
3.2	Reports to Management	30
Section 4.0	DATA REVIEW	31
4.1	Data Verification (Step I)	31
4.2	Data Validation (Steps II and III)	31
4.2.1	Validation	31
4.2.1.1	Level-I/II Data Validation	31
4.2.1.2	Level-III Data Validation	31
4.3	Data Uncertainty Assessment (Step III)	31
Section 5.0	REFERENCES	33

FIGURES

Figure 1.1 Project Organization Chart

Figure 1.2 Site Location Map

Figure 1.3 Site Map

Figure 2-1 Flowchart Showing Activities to be Performed at Site 14 Wells

Figure 2-2 Proposed Locations for Installation of Additional Monitoring Wells and Quarterly Sampling Network

TABLES

Table 1.1	Project Personnel Sign Off Sheet (QAPP Worksheet #9)
Table 1.2	Program Personnel and Project Proposals/Status
Table 1.3	Data Quality Objectives: Replicate MET and Pipeline Integrity Testing
Table 1.4	Data Quality Objectives: Replicate Analysis of Groundwater
Table 1.5	Analysis List, Precision, and Accuracy for Groundwater Samples
Table 1.6	Project Economics and Schedule (QAPP Worksheet #8)
Table 1.7	Monitoring Objectives and Construction Data for the Proposed Monitoring
Table 1.8	Sampling Locations/IDs, Sample Depth, Sample Analysis and Sampling Procedures (QAPP Worksheet #10)
Table 1.9	Analytical Methods, Comments, Preservatives, and Holding Times (QAPP Worksheet #11)
Table 1.10	Reference Levels – Groundwater (QAPP Worksheet #12)
Table 1.11	Field Quality Control Sample Summary (QAPP Worksheet #13)
Table 1.12	Measurement Performance Criteria – Field QC Samples (QAPP Worksheet #14)
Table 1.13	Quality Control, Acceptance Criteria, and Corrective Action
Table 1.14	Field Equipment Calibration, Maintenance, Testing and Inspection (QAPP Worksheet #15)
Table 1.15	Communication Procedures (QAPP Worksheet #16)
Table 1.16	Verification Process (QAPP Worksheet #17)
Table 1.17	Validation Steps 1a and 1b Process (QAPP Worksheet #18)

ABBREVIATIONS AND ACRONYMS

AD	Assembly Tool
bg	background surface
CAP	Customer Action Plan
CFR	Code of Federal Regulations
CFR	customer correction actions
CSM	conceptual site model
DGPS	differential global positioning system
DI	drawings
DO	draw level output
DoD	(United States) Department of Defense
DoN	Department of the Navy
D-QI	data quality indicator
D-QO	data quality objective
D-TW	depth to water
EEL	environmental screening levels
EWI	Environmental Work Instructions
FD	Flow direction indicator
GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
GW	groundwater
HPLC	high performance liquid chromatography
ISA	Indian Act/Agreement
IATA	International Air Transportation Association
IE	identification
IE-QTF	International Data Quality Task Force
IE-W	investigation derived waste
ICS	laboratory control standard
LQAP	Laboratory Quality Assurance Plan
ML	method detection limit
mm	millimeters
MS	meter spike
MSD	meter spike depth site
NAD	North American Datum
NAE	Naval Air Station
NAEA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NEOH	Naval Environmental Data Observatory

HEFEC	Naval Facilities Engineering Service Center
NRIS	Naval Installation Restoration Information System
DEL	evaluation or deletion potential
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
PQL	Purple Quantities Limit
PVE	polypropylene
QA	quality assurance
QA/QC	quality assurance/quality control
QA/Q	quality assurance officer
QA/QP	quality assurance project plan
QC	quality control
QL	quantities limit
FCICC	Federal Office in Charge of Construction
RPO	release point of difference
RPM	Regional Project Manager
SAM	Site Assessment and Mitigation
SAP	Sampling and Analysis Plan
SHSO	Site Health and Safety Officer
SHSP	Site Health and Safety Plan
SIS	Strategic Internal Standard
SOP	Standard Operating Procedure
SWPCC	State Water Resources Control Board
TPH	total petroleum hydrocarbons
TPH E	total petroleum hydrocarbons extractable
TPH G	total petroleum hydrocarbons generated as gasoline
TPH P	total petroleum hydrocarbons present
TSA	Technical Systems Audit
UFP	Uniform Federal Policy
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VMA	volatile organic aerosols
VOC	volatile organic compound
WATE	Wastewater Aquifers Treatment System

Section 1.1- PROJECT MANAGEMENT

This Sampling and Analysis Plan (SAP) has been prepared to support the work to be performed by Battelle for the Naval Facilities Engineering Command (NAVFAC) Southwest Division under Contract No. N69713 00 2 1000, Task Order No. 0017 at the 14 South Fremont Naval Air Station (NAS) Moffett Field, Moffett Field, California.

The objective of the effort is to install additional groundwater monitoring wells to be sampled along with existing monitoring wells to further characterize the lateral and vertical extent of dissolved phase petroleum hydrocarbons present in groundwater at the site. If the monitoring data suggest that a leak is present, then leak mapping and leak testing may be performed on the existing DSTs and associated piping to determine if there is an ongoing source of petroleum hydrocarbons to the subsurface.

The information presented in this SAP is organized into four groups according to their function and are based on International Standards Organization (ISO) 9000 Standards Federal Policy (ISPP) – Quality Assurance Project Plans (QAPP) (United States Environmental Protection Agency (EPA) 816, 2005) as follows:

- A. **Project Management and Organization** – this group is divided into elements describing general areas of project management, project history and objectives, and roles and responsibilities of the participants.
- B. **Measurement/Data Acquisition** – this group is divided into elements describing the experimental design, sampling and analysis methods, sample handling, and quality control (QC) requirements.
- C. **Assessment and Oversight** – this group is divided into elements describing activities for ensuring the effectiveness of sample collection and analysis and associated quality assurance/quality control (QA/QC) requirements.
- D. **Data Review** – this group is divided into elements describing quality assurance (QA) activities that occur after the data generation and acquisition phase of the project has been completed to ensure that data conforms to the specified criteria, and thus are useful for their intended purpose.

1.1 Title and Approval Page

The SAP Project Title and Approval sheet is provided on page ii of the SAP.

1.2 Table of Contents

The SAP Table of Contents is provided beginning on page iii of the SAP.

1.3 Distribution List

The SAP Distribution List is provided on page v of the SAP.

2.4 Project Organization and Responsibilities

Figure 2-1 illustrates a project organization chart. Key personnel shown in the chart include the Navy, Remedial Project Manager (RPM), Site or Quality Assurance Officer (QA Officer), the President/Officer in Charge of Construction (OIC) for McFert Field, Site/In Situ Project Manager, Site/In Situ Program QC Manager, the Site/In Situ Health and Safety Officer, and the Site/In Situ Project Team. Key role-related functions are categorized to include the following: analytical laboratory for analysis of water, subsurface soils, leachate, and/or for installation of wells; conversion for site layout and to locate additional wells; and wells or leak detection to detect or pump water collection during capping. Key roles and responsibilities for technical staff associated with the work outlined in this EAP are presented in the Distribution List (which includes contact information) and Table 2-1.

Regulatory agency personnel, in conjunction with the Department of the Navy (DON), provide input to the EAP and approve decisions and recommendations presented in investigations reports. Agency project managers are responsible for overseeing and monitoring progress of the work at the site. The regulatory agency providing oversight of this project is the "Watch Board."

2.5 Problem Definition/Background

Site 14 South is an unconsolidated, self-subsiding station for steel containers at the intersection of Early Road and Elm Street in McFert Field (Figure 2-2 and 2-3). The site is currently used as a container vehicle refueling facility and a storage area for diesel-powered vehicles, a small, newly-erected structure building (Building 411), and two 12,000-gallon, double-walled, fibreglass USTs (Tank PG, containing diesel fuel and Tank 21, containing unleaded gasoline). The site encompasses approximately 1 acre and is a paved surface paved with asphalt or concrete.

The site previously contained two 4,000-gallon USTs (Tanks 19 and 20), which were removed in 1994. Tanks 19 and 20 were reportedly used to store unleaded gasoline and diesel fuel, respectively. A release was originally detected in the area system when Tanks 19 and 20 were replaced in 1994. The two new USTs (Tanks 19 and 21) were installed adjacent to the location of the former USTs. The new USTs were connected to the fuel dispensing with new product lines and secondary containment trench. The newly replaced product piping was later removed and replaced with double-walled fibreglass piping in the late 1990s to code 3045. The new USTs and piping systems are active today (Tetra Tech FW, Inc., 2004a).

Site assessment activities were performed concurrently with an evaluation of corrective action alternatives for Site 14 South. The results of these activities were documented in the *Final Site 14 South Corrective Action Plan (CAP) and Associated Work Plan: Former Naval Air Station McFert Field, a Subpart (Tetra Tech FW, Inc., 2004a) and the Addendum to Site 14 South Corrective Action Plan and Associated Work Plan (Tetra Tech FW, Inc., 2004b)*. Site assessment activities indicated that chronic contamination of petroleum hydrocarbons were present in groundwater. Additionally, this product has not been observed in any of the 28 frequency wells installed during the site assessment activities. Based on this information, an investigation (evaluation using a modified Foster's regime) was implemented as the corrective action for the site. Initially, containment reduction was achieved in the source area using this approach, however, subsequent evaluation of containment and contamination in groundwater were observed as presented in the *Drift Site 14 South Program Report (Tetra Tech QC, Inc., 2004)*. As a result, it was determined that additional corrective actions would be required to address containment reduction in containing wells at the site. A preliminary evaluation of alternatives was included in the *Drift Site 14 South Program Report* and identified one system as a potential system to address petroleum hydrocarbons in groundwater (Tetra Tech QC, Inc., 2004).

Based on a thorough review of available site data, it has been concluded that more data gaps will remain with respect to delineation of the dissolved phase groundwater plume. Therefore, the HRP proposes to perform additional site characterization activities (i.e., four quarters of groundwater monitoring) to fill these data gaps and develop an updated, comprehensive conceptual site model (CSM). Following completion of the updated CSM, an updated alternative evaluation will be conducted to identify an appropriate alternative to address the dissolved phase groundwater plume at Site 14 South.

1.8 Project/Task Description

The major activities for this task order are as follows:

- Install seven additional monitoring wells
- Perform groundwater sampling to delineate, at least, the extent of dissolved concentrations of petroleum hydrocarbons in groundwater at Site 14 South
- If monitoring data suggests that an ongoing leak is present, integrate well leak testing, may be performed on the existing UGIs (Units 10 and 11) and associated piping. The results would be used to verify whether there is an ongoing source

The site ground monitor for the field activity is approximately one year, beginning in the first quarter of 2006 and extending through the fourth quarter of 2006.

1.9 Quality Objectives and Criteria for Measurement Data

This section presents the data quality objectives (DQOs) for the project and the performance criteria necessary to describe DQOs. Included are discussions of the project DQOs, quantitative DQOs (quantity, accuracy, and completeness), and qualitative DQOs (representability and representativeness). The overall DQO objective is to generate data that are of known, documented, and defensible quality.

1.9.1 Data Quality Objectives. DQOs are statements that specify the quantity and quality of the data required to support project decisions. DQOs were developed for this project using the seven-step process listed in Data Quality Objectives *Principles for Hazardous Waste Site Investigations* (U.S. EPA, 2000). The DQOs are presented in Tables 1.3 and 1.4. The QC procedures as well as the associated well sampling procedures for this project will be based on values of these DQOs as a basis, not effects, and risk issues.

1.9.2 Quantitative Objectives: Precision, Accuracy, Completeness and Reliability. Precision quantifies the repeatability of a given measurement. Precision is estimated by including the relative percent difference (RPD) of field duplicates, as shown in the following equation:

$$RPD(\%) = \frac{|\text{Result}_1 - \text{Duplicate Result}_1|}{(\text{Result}_1 + \text{Duplicate Result}_1)/2} \times 100$$

The laboratory will review the QC results to ensure that minimal QC data is within the limits of acceptability. Any suggestions will be investigated and corrective actions taken. The analytical performance/speaking limits for this project are listed in Table 1.5.

Accuracy refers to the percentage of a known amount of analyte recovered from a given matrix. Percent recovery is estimated using the following equation and can be calculated for the project specific matrix (e.g., water and soils):

$$\text{Recovery Matrix Spike} = \frac{\text{Recovery Matrix Spike Recovered (LGE) and Recovery Matrix Spike (RIS)(\%)}}{\text{Recovery Matrix Spike Added}} \times 100$$

$$\text{Recovery Matrix Spike} = \frac{\text{Typical Sample Result} - \text{Sample Result}}{\text{Spike Added}} \times 100$$

The recovery of most typical organic compounds is expected to fall within range of 70 to 130%. Accuracy goals for this project are listed in Table 1.3.

Completeness refers to the percentage of valid data received from actual testing done in the laboratory. Completeness is calculated as shown in the following equation. The target completeness goal for all compounds is 90%. The goal by building team will be 100%.

$$\text{Completeness (\%)} = \frac{\text{Number of Measurements (Valid/Valid)}}{\text{Total Number of Measurements}} \times 100$$

Consistency is the repeatability of a test, method or measurement in that results between measurement replicates representing different levels (e.g., concentrations) of an analyte of interest. Consistency has been addressed primarily through the selection of appropriate analytical methods, equipment, and measurement systems. It will be monitored through the achievement of the established method detection limits, measurement validation and proficiency testing.

1.3.3 Qualitative Objectives: Comparability and Representativeness. Comparability is the degree to which one dataset can be compared to another. To ensure comparability, samples will be collected at specified intervals and in a similar manner, and will be analyzed within the required holding times by accepted and comparable methods. All data and results used in reporting for this project will be consistent with accepted conventions for environmental data analysis. This approach will ensure direct comparability between the results from this project and the results from other projects using the methods presented in the SAP.

Representativeness is the degree to which a sample or group of samples is reflective of the population being studied. Over the course of a project, samples will be collected in a manner such that they are representative of both the chemical composition and the physical state of the media at the sample location at the time of sampling.

1.4 Special Training/Certification

All personnel performing the work must comply with Occupational Safety and Health Administration (OSHA) requirements as specified in 29 Code of Federal Regulations (CFR) 1910.

Additional health and safety training requirements for this project can be found in the Work Plan for „the Site Health and Safety Plan (SHSP)“. All Site health and safety contractor personnel involved in hazardous waste site operations are required to receive an initial 40 hours of health and safety training and annual refresher training. In addition, the Site Health and Safety Officer (SHSO) will oversee additional specialized hazardous waste operations management. This training will include, but will not be limited to, the following: the employer's health and safety program, Hazard Communication Program, personal protection equipment (PPE), spill containment, health hazard monitoring techniques, and preliminary remediation (EIR), dust and soil biochemistry pathogen control training.

Field team members will be adequately trained in field methods and sampling procedures outlined in this plan. Field team members will be required to read and understand the EAP and sign the Sign Off sheet (Table 1-3). The completed Sign Off sheet will be maintained with the field records. Specifically, field team members will have training on the following field activities: GFT integrity testing, drilling, well installation, well operations, screening for the presence of VOCs using a handheld flame-ionization detector (PID), groundwater sampling using bubble gauges, use of water level indicators, and related field equipment, sample handling, packaging, and shipping, and handling of investigations derived waste (IDW). The Hanford Project Manager will maintain training records for all field personnel as part of the project file. Training records demonstrating compliance with OSHA requirements as specified above shall be printed or maintained on file at Site 14 South during field activities.

1.6 Documentation and Records

The general types of documents and records that will be maintained for this project are outlined in Table 1-6. The Project Manager is responsible for maintaining the project records. This requirement includes the maintenance of all records and data necessary for QC, regulatory, corrective actions, and other associated documentation. Project documentation will be maintained for a minimum of 10 years following completion of the project.

Section 2.0: FIELD SAMPLING PLAN DATA GENERATION AND ACQUISITION

The following sections describe the field activities that will be performed as part of the site assessment at Site 14 South. These activities include installing seven additional monitoring wells, which will be developed and surveyed after installation. Groundwater sampling will then be conducted to adequately delineate the extent of petroleum hydrocarbon in groundwater at Site 14 South. If the results of groundwater monitoring indicate that there may be a continuing source, then leak testing may be performed to evaluate the integrity of USTs 16 and 71. Figure 2-1 presents a diagram illustrating the activities that will be performed at Site 14 South.

2.1 Sampling Process Design

Groundwater sampling will be conducted to adequately delineate the extent of detected concentrations of petroleum hydrocarbon in groundwater at Site 14 South. Additional site assessment activities will include the installation of seven additional groundwater monitoring wells, which will include two deep and shallow nested well pairs (MW SA-16D and MW SA-16Sh; one nested well (MW SA-16D) will be located in the vicinity of the former USTs to delineate the extent area and another (MW SA-16Sh) approximately 30 ft downgradient of the former USTs to delineate the perimeter of the plume). In addition, three wells (MW SA-1, MW SA-4 and MW SA-5) will be installed to define the water plume extent, two of which will be located cross gradient of each other to define the lateral extent and the other will be installed upgradient of the former USTs to define the upgradient extent. If a leaked concentration is observed in any of these three wells, then all three wells will be installed at a location "stopped out" from the original well. This contingency is meant to ensure that the entire extent of the plume is completely defined and traced (see Figure 2-2). Due to the lack of free product observed at the monitoring wells have been screened below the top of the water table. However, in order to ensure that free product is not overlooked, all open top wells will be tested using an oil-water interface probe prior to the construction of the monitoring wells. If free product is observed, then the top of the screen of all shallow wells will be extended above the top of the water table. Any change to the sampling design will be approved by the Remedial Project Manager (RPM) and documented as a field change order. Changes to the Sampling and Analysis Plan (SAP) will be made in accordance with Naval Facilities Engineering Command (NAVFAC) Southwest Environmental Work Instruction (EWI) 40. Figure 2-3 presents a site map illustrating the estimated extent of petroleum hydrocarbon contaminants in groundwater, as well as proposed locations for additional groundwater monitoring wells.

Additional details regarding site closure and permitting, monitoring well construction and development, and site surveying can be found in the Work Plan. Groundwater samples will be collected from a newly installed monitoring network which will consist of the newly installed wells in conjunction with a subset of the monitoring wells that currently exist at the site (see Figure 2-3).

2.2 Procedures for UST Leak and Integrity Testing

To date, free product has not been observed during historical environmental activities at Site 14 South, and further indications or evidence have indicated that the existing tanks are not leaking. However, the groundwater monitoring results will be evaluated to determine whether there may be a continuing source of hydrocarbon mass to the subsurface. If the results indicate that there may be a continuing source, USTs 16 and 71 may be tested.

A commercially available tank testing system known as VACUTEST[®] will be used to

determine the integrity of the USTs and associated piping at the site. This California Environmental Protection Agency approved system (EPA CMAA 3007) characterizes the integrity of storage tank systems by monitoring for changes in pressure, as water under liquid level in the tanks when the system is subject to a vacuum. The system allows for the detection of leaks as well as the nature and location of the leak. In addition, this approach is critical to test USTs with varying levels of product, therefore, per grouping of the USTs is not required.

In general, all openings to the tank are sealed off and a mild vacuum is applied by drawing air out of the tank using a vacuum pump. The vacuum level is continuously monitored and maintained by the computer in the testing unit. While under vacuum, the VACUTECT[®] system monitors three types of parameters, as listed below:

1. **Liquid Level:** The liquid level at the bottom of the tank is monitored to a resolution of 0.5 millimeters (pin). An increase indicates that the water being drawn through a leak.
2. **Sound:** The probe contains a hydrophone which listens for sounds. A building sound indicates that air is being drawn in and building up through the product. A whistling sound indicates air being drawn into the sillage space (empty top portion of the tank).
3. **Pressure:** The pressure in the tank is monitored to see if the tank is building a vacuum. A constant loss of vacuum indicates a leak.

For leak testing in product delivery lines associated with the USTs, a TLD-1 pipeline leak detector will be utilized. This California EPA approved detection system (EPA CMAA 3007) is an effective method for detecting very small leaks. The system is based on the simple principle that liquid fluid does not compress when placed under pressure. To conduct the test, the pipeline is pressurized with product. If the line is leaking, the test apparatus measures the amount of liquid passing the line through the leak and calculates detection of a leak rate.

As illustrated in Figure 3, the TLD-1 test apparatus is attached to the line at the union underneath the pump. The line is then pressurized into the water and a pressure of 1.5 times the operating pressure of the line is applied. The level of liquid is noted in the graduated cylinder of the test apparatus. Liquid level readings are then observed at six minute intervals. This allows for an accurate calculation of a leak rate in liters-per-hour.

Data generated during tank integrity testing at Site 18 tanks will be prepared in a summary report following the completion of field activities. Assuming no leaks are detected, additional characterization activities will be conducted as described in section 2.3. In the event that active leaks are observed in the UST or auxiliary piping system, National Assessment and Spill Assessment (NASSA), the White House and U.S. EPA Region 9 will be informed immediately. The State will then coordinate with M&E, regarding the leak (see Figure 2-1).

2.3 Sampling Methods

This SAP has been prepared to ensure that the data quality objectives (DQOs) specified for this project are met, the field sampling protocols are implemented, documented, approved in a standard manner, and the data collected are statistically valid and defensible. The following table outlines a breakdown into the following four parts in order to present a well-organized description of the sampling and analytical requirements for the major project elements including:

- Wet installations prior to start,

- Groundwater sampling procedures,
- Investigation of waste (IDW) management, and
- Environmental procedures.

3.3.1 Well Installation: A nominal 8 inch diameter bore hole will be drilled for each groundwater monitoring well to the required depth below ground surface (ignoring a surface stone layer (SSA)) following the construction details and the monitoring site status for each of the seven proposed groundwater monitoring wells as summarized in Table 3-1. The minimum depth to groundwater at Site 14 South is 4 to 7 feet. The top of the filter pack will be approximately 1 ft above the top of the screen. A transition well will be set in the annular space around the well casing. The transition well will consist of approximately 1 ft of sand from horizontal shape placed on top of the filter pack. For the manufacturer's instructions, gravelly water will be poured down the annular to top drive the horizontals to form a tight seal. The horizontals seal will be permitted to solidify approximately 30 minutes before the gravel seal is installed. The monitoring annular space will be installed with horizontals gravel slurry to approximately 3 ft high. A concrete surface seal will be ring level above the horizontals gravel slurry to complete the well construction.

The monitoring well will be completed with leak resistant protective steel casing in areas of high traffic. The top of the polyvinyl chloride (PVC) casing will be terminated approximately 8.5 ft high and covered with a locking-puller plug. If an above-ground measurement is appropriate for well completion, a ground, steel gravel measurement structure will be placed over the well casing and sealed on a 3-ft diameter, concrete surface seal. In traffic areas, four protective poles also will be installed in the center of the concrete pad. A lid will be included in the design of the guard measurement that it can be locked. All monitoring wells will be clearly marked and permanent identification tags with well numbers will be attached to the inside of the protective casing covers.

Groundwater monitoring wells installed during the site assessment will be surveyed for the location and elevation of the ground surface, the highest level measuring reference point (i.e., top of the PVC casing) and the top of the protective site casing. All monitoring wells measured to the nearest 0.01 ft using the benchmark located on the base. A reference point will be established on monitoring wells by a metric or a permanent mark on the casing. A qualified surveyor working under the supervision of a California license of professional surveyor will perform the groundwater monitoring well surveying according to North American Datum (NAD 83) or U.S. survey base. Survey equipment will be calibrated on an interval with the national reference or measurements.

3.3.2 Groundwater Sampling Procedures: Groundwater sampling and analysis from the surface of monitoring well networks (including the newly installed wells) will be conducted as part of a delineation assessment activities at Site 14 South.

During sampling activities, the air in the breathing zone will be monitored with an ozone concentration detector (OCD) or equivalent to ensure that no gassing or toxic organic compounds (TOCs) do not pose a potential risk to the IDW sampling team. The instrument will be calibrated on an interval with the manufacturer's instructions.

3.3.2.1 Groundwater Level Measurement Procedures: Groundwater level measurements will be taken from each monitoring well at the site before pumping is initiated. The groundwater will be allowed to equilibrate with atmospheric conditions for approximately 4 hours before taking water level measurements. A permanent reference mark will be located or verified near the top of the casing to

provide a consistent reference point from which all levels are measured. Depth to water (D_{TW}) measurements will be taken to an accuracy of 0.01 ft using an electronic interface probe. The electronic interface probe will be the instrument as described in Section 1.3.1. The measurements will be checked by directly viewing and lowering the tape and watching the instrument response. The measurement will be recorded in the field logbook.

2.3.2.2 Well Purging and Sampling Procedures: Monitoring wells at Site 14 South will be sampled with a Marietta pump using the low flow purging (overpurge) method as described in the *Safe Manual* (USEPA, 2004). The objective of overpurging is to remove water to the groundwater system by decreasing the volume caused by pumping. Pumping at a low flowrate effectively isolates the screened interval from the overlying (discharge) or underlying water, thereby pumping water from the screened interval only. Typically, flowrates on the order of 0.1 to 0.5 L/min are used during overpurging. The overall goal of overpurging is to achieve drawdown less than 0.12 m or 0.35 ft in the well during purging.

Following the initiation of purging, the water level in each well will be measured during drawdown to determine the most appropriate flowrate for the well. During purging, on-line water quality parameters will be monitored continuously as a flow through cell with a HANNA® 9120. Water level monitoring and water quality parameter measurements should be taken every three to five minutes. Stabilization is achieved after three consecutive readings within:

- ±0.2 units for pH
- ±20 millivolts for oxidation-reduction potential (ORP)
- ±0.2 mg/L for dissolved oxygen (DO)
- ±2% of reading (±0.1°C) for temperature
- ±5 to 1% of reading for conductivity

2.3.2.3 Groundwater Sample Collection: Table 2-3 summarizes all sampling locations, screened intervals, and analyses for the wells included in the monitoring network for Site 14 South. Each well will be purged until parameter stability occurs, at which point sampling will be initiated. To collect a representative groundwater sample, the on-line water quality parameter monitoring device for sample collection will be disassembled or bypassed. The sample flowrate will be adjusted to maintain constant, steady flowrates. Immediate filling of sample bottles, or loss of volatiles due to extended pumping time or tubing. Samples will be collected in appropriate sample containers for the appropriate type of analysis to be performed. Table 2-3 lists sampling methods and the appropriate sample containers, holding times, and preservation methods associated with each method. After the sample container has been filled with groundwater, a Teflon™ lined cap will be secured tightly to prevent the container from leaking.

2.3.3 Investigation Ground Water (IGW) will be profiled during the site investigation. The well installation and on-line sampling efforts will produce IGW as taking well readings, used personal protection equipment (PPE), groundwater, and the installation water.

2.3.3.1 Spill Waste: The well installation effort will produce seal-rings, which will be placed approximately in 15 gal drums. Used PPE also will be contained in drums. A private contractor will be provided to remove all IGW from the site and dispose of it properly. Original copies of the manifest and disposal certificate from the waste will be provided to the transport and disposal.

Copies of waste manifests and receipts for the disposal of wastes will be retained.

2.3.3.3 Liquid Waste: The des-accumulation, soil development, and groundwater sampling activities will produce wastewater, which will be stored temporarily in a 10 gal drum or tank. The wastewater will be transported and analyzed prior to disposal. Borello will arrange for the disposal of the wastewater at an appropriate hazardous waste disposal facility on the Moffett Field West site Aquifer Treatment System (MAFAS) facility.

2.3.4 Des-accumulation Procedures: Des-accumulation will be achieved by process completed on a field equipment to reveal more contaminants between samples and to ensure the health and safety of field personnel. Des-accumulation water will be collected in an appropriate container and disposed of according to Section 2.3.4. The following sequence will be used to clean equipment and sampling device prior to and between each use:

- Flush with potable water
- Wash with Laprene™ detergent and tap water and clean with a stiff brush/brush
- Flush three times with deionized (DI) water
- Flush with rinsed grade methanol
- Place the sampling equipment on a clean surface and air dry

2.3.5 Field Corrective Action: Corrective action may be initiated by any of the points goals of the field data generation process (i.e., field technicians, field team, or project manager). It is important to generate corrective action early in the field sampling process so that the problem has a greater chance of being resolved in a timely and cost-effective manner.

For field maintenance, if the final collection check on any of the field sampling equipment reveals an operator's fault, then the error will also be reflected that day within flagging. On the following day, a single point monitoring collection check will be run after every five measurements to determine how long the collection holds. Collection frequency will be adjusted as needed.

2.4 Sample Handling and Custody

This section presents sample handling and custody procedures. These procedures will ensure proper handling, custody, and documentation of the sample from field collection through laboratory analysis.

2.4.1 Sample Containers, Preservation and Shipping Time: Requirements for sample containers, preservation, and holding times are listed in Table 2-3. Here, certified pre-washed sample containers will be used for sample collection. Once collected, each container and sample will be labeled and placed into a matrix upon the sample transfer. The sample vials will store in the shipping container and will be packed with vermiculite insulation to the appropriate temperature for preservation.

2.4.2 Sample Numbering: Each sample collected will be given a unique sample identification (ID). The sample ID is project specific and a record of all sample IDs will be kept with the field notes and entered into chain of custody form. The labeling scheme for sample identification will be the numbering well number (i.e., NW 24, 1) for groundwater samples.

2.4.3 Sample Labeling: Each sample collected will have a sample label affixed to the outside of the container or an adjacent location. All information will be provided on the label with water resistant ink. The sample label information will include the sample identification number, date and time of sample, sample's name or matrix, preservation method, sample collection method, and site name.

3.4.4 Sample Custody All samples collected under this task order will be logged onto a chain of custody form in the field prior to shipment in packaging by the laboratory. The chain of custody form will be signed for the individual responsible for custody of the sample collection, and the sign-off will accompany the samples to the laboratory. One copy of the chain of custody form will be kept by the project manager and included in the project files.

Information to be recorded on the chain of custody form should include:

- Sample location
- Sample collector's name
- Date/Location of sample collection
- Sample identification numbers
- Number and type of containers for each sample's layout
- Type of preservation
- Quality control (QC)-sample designation
- Analytical method
- Special handling instructions
- Destination of sample
- Name, date, time, and signature of each individual in using the shipping container

The laboratory will designate a sample custodian. This individual is responsible for mapping and verifying the collection of the chain of custody to make up an sample report. The sample custodian will verify the samples by signing the chain of custody form and noting the condition of the samples in the space provided on the chain of custody form in other reports form. The sample custodian will notify the Project Field Team Leader of any discrepancies. The chain of custody is intended to be a legal document and thus will be filled out legibly and as often as possible. Samples received by the laboratory will be entered into a sample management system, which will include:

- Laboratory sample number
- Field sample identification
- Analytical batch number
- List of analyses requested for each sample

Immediately after receipt, samples will be stored in a secure storage area. The analytical laboratory will maintain accurate records showing the chronology of sample handling during the analysis process by various individuals at the laboratory.

3.4.5 Sample Packaging and Shipment. Upon data following sample collection, sample labels will be affixed to each sample container. Samples will be placed in a container specific size chest, or cooler. The sample will be packed with shock absorbent materials, such as bubble wrap, to prevent movement, or leakage of the sample gas during transport. The ice chest will be filled with cool ice which will be double bagged in reusable bags in order to meet the temperature requirements (3-6 °C). A temperature block will accompany each cooler. Sample cooler drain system (if present) will be taped from the inside and outside of the cooler to prevent any leakage.

The chain of custody forms will be placed in a sealable bag and taped to the inner lid of the cooler. The ice chest will be loaded with packaging tape and custody seals will be placed along the ice chest lid in order to prevent an outside tampering. The cooler containing the environmental samples will either be picked up by the laboratory or arrangements will be made to have the cooler delivered to the laboratory by an overnight delivery service such as Federal Express. International Air Transportation Association (IATA) regulations will be adhered to when shipping samples by air across oceans. If an overnight delivery service is used, the package must be certified for priority overnight service to ensure that the temperature preservation requirement is not violated. Security clearance will be coordinated with the laboratory.

2.4.8 Field Documents and Records. A project specific field logbook will be used to provide daily records of significant events, observations, and measurements during field investigations. The field logbook also will be used to document all sampling activities. All logbook entries will be made with ink. It is the intent to provide a permanent record. Logbooks will be kept in the possession of the field team leader during the work week and all members of the field team will have access to the notebook. These notebooks will be maintained as permanent records. Any errors found in the logbook will be corrected, crossed through, and initialed by the person discovering the error.

The field notebooks are intended to provide sufficient data and observations to document events that occurred during field activities. Field logbooks should be permanently bound and pre-paginated; the use of the pre-paginated forms should be used whenever possible to ensure that field records are complete. The following items are examples of information that may be included in a field logbook:

- Name, date, and time of entry
- Names and responsibilities of field crew members
- Name and make of any site vehicle
- Description of field procedures, and problems encountered
- Weather and amount of samples taken at each location
- Details of sampling location, including sampling coordinates
- Sample identification numbers of all samples collected
- Date and time of collection
- Sample collector
- Sample collection method
- Documentation practices
- Field instrument calibration and maintenance
- Field measurements (e.g., dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, pH, and conductivity) and ground observations

2.5 Analytical Services

This section presents criteria for laboratory selection and discusses methods to be used for analysis of groundwater, and IDW samples.

2.5.1 Laboratory Selection. Leadair Testing Laboratories has been selected to perform the analysis required for this project. Leadair has successfully completed the Navy evaluation process through the Naval Facilities Engineering Service Center (NFESC) for the analysis of asbestos, lead, and specified asbestos by the Navy. Leadair is a California certified and NFESC approved laboratory. It maintains a Quality Assurance Plan that describes the quality system for the organization and will perform all analyses according to the requirements of this plan (Leadair Testing Laboratories, 2004). In addition, laboratory practices will generally follow the latest version of the Army Installation Porting and Force of Quality Manual (U.S. Army, 1999), the Department of Defense Quality System Manual for Environmental Laboratories (U.S. Department of Defense (DoD), 2000), and the S&P

The laboratory maintains a set of standard operating procedures (SOPs) that document any changes from the established methods. In addition, the laboratory maintains standard operating procedures for analytical instruments that detail instrument operation, calibration, maintenance, testing, and inspection activities.

Table 2-1 Project Manager will coordinate sampling and analysis schedules to the laboratory with sufficient lead time to meet contractual agreements with the laboratory.

2.5.2 Laboratory Analytical Methods. Standard U.S. EPA laboratory analytical methods were selected based on the project SQR and in consultation of the method data team leads allowable for each parameter. Each laboratory analytical method was chosen to address the intended use of the sampling data. Table 2-2 presents the methods that are to be used.

2.5.3 Quantitative Reporting Levels. Factors that influence the quantitative reporting levels of analytical methods include the analytical method tool, sample matrix interference, and high concentration limits of the target analyte. Actual reporting limits may vary from sample to sample in accordance with standard laboratory practices. Table 2-4 presents the reporting limits for the analytical methods.

2.6 Quality Control Requirements

Quality assurance (QA) is an integrated system of activities in the area of quality planning, assessment, and improvement to provide the project with a reasonable assurance that the established standards of quality are met. Quality control (QC) checks, including both field and laboratory, are specific operational techniques and activities used to fulfill the QA requirements.

2.6.1 Field Quality Control. Table 2-5 provides a summary of the field QC samples. Table 2-6 lists the measurement performance criteria for the field QC samples. The field QC samples will be assigned unique sample numbers and submitted to the analytical laboratory. If measurements are detected in field QC samples, the data associated with the QC samples will be flagged and appropriate actions will be taken to rectify a error.

2.6.1.1 Field Duplicate Samples. Field duplicate strategy duplicate samples will be collected at a rate of 20% of the total number of groundwater samples during each groundwater sampling event. For all water samples, duplicate samples will be collected by obtaining consecutive samples from the sampling device.

2.6.1.2 Equipment Rinse Blanks. Equipment rinse blanks will be collected daily during ground water sampling to ensure that rinse stored sampling devices have been decontaminated effectively. Equipment rinse blanks will consist of the rinse water used in the final step of the sampling equipment decontamination procedure. Rinse samples will be collected at a frequency of one per day during groundwater sampling events.

3.4.2.2 Trip Blanks. Trip blank samples will accompany each vehicle monitoring groundwater samples. They will be prepared at the analytical laboratory by filling volatile organic analyte (VOA) vials with DI water. Trip blanks will not be opened in the field and will be analyzed for all analytes listed in Table 3-4. Trip blanks indicate whether the field samples have been contaminated during storage and shipping. The results of the trip blank analyses will be used to evaluate the field sample data or a measure consistent with the project D-QOs.

3.4.2.4 Source Blanks. Source blanks are collected to ensure that water used during equipment decontamination is not a source of contamination. Source blank samples will be collected at a frequency of one for each source of water used for equipment decontamination (due the duration of the survey). If the source for the decontamination water changes, additional source blank samples will be collected. To prepare source blanks, the appropriate container (refer to Table 3-10) will be filled with source water at the same time that it is used for the decontamination. Source blanks will be analyzed for analytes listed in Table 3-4.

3.4.2.5 Temperature Blank. Temperature blank samples will accompany each vehicle that contains samples with a temperature preservation requirement. The temperature blank will be prepared either by the analyst at laboratory or the field sampling crew by filling VOA vials with DI water. The temperature of the sample will be verified upon arrival at the analytical laboratory using the temperature blank.

3.4.3 Laboratory Quality Control. Laboratory QC is addressed through the analysis of laboratory QC samples, documented internal and external laboratory QC practices, and laboratory audits. The types of laboratory QC samples will be project-based and specific, but may include laboratory control samples, laboratory duplicates, matrix spikes (MS), surrogate standards, internal standards, method blanks, and measurement blanks. MSs, matrix spike duplicates (MSDs), and an laboratory control standard (LCS) are used, and for every batch of up to 25 samples used serve as a measure of analytical accuracy. Surrogate standards are added to all samples, blanks, MSs, MSDs, and LCSs which are analyzed for organic compounds in order to evaluate the method's accuracy and to help determine matrix interferences. Proficiency of each type of laboratory QC sample are listed in the following subsections. The laboratory measurements, if any, of the QC checks are outside the acceptance criteria, corrective actions will be taken based on procedures outlined in Table 3-7 and the laboratory's Quality Assurance Plan. The laboratory QC checks, acceptance criteria, and corrective actions are listed in Table 3-7. The measurement quality objectives for the LCS, MSD/MSDs, surrogates, and laboratory duplicates are defined in Table 3-8.

3.4.3.1 Laboratory Control Samples. Laboratory control samples include blank spikes and blank spike duplicates. Blank spike samples are designed to check the accuracy of the laboratory analytical procedures by measuring a known concentration of an analyte in the blank spike samples. Blank spike duplicates samples are designed to check laboratory accuracy and precision of the analytical procedures by measuring a known concentration of an analyte in the blank spike duplicate samples. Blank spike and blank spike duplicate samples are prepared by the laboratory using clean laboratory materials spiked with the same spike-level compounds used for matrix spikes at levels approximately 10 times greater than the method detection limit (MDL). Laboratory control samples are processed concurrently with each analytical batch of 250 samples.

3.4.3.2 Laboratory Duplicates. Laboratory duplicates are two aliquots of a sample taken from the same sample container under laboratory conditions and analyzed independently. The analysis of laboratory duplicates allows the laboratory to measure the precision associated with laboratory procedures. Laboratory duplicates are processed concurrently with each analytical batch of 250 samples.

3.4.3.3 Matrix Spikes. MS and MSD samples are designed to check the precision and accuracy of the method at levels through the analysis of a field sample with a known amount of analyte added. Additional samples to be used for MS and MSD samples is collected in the field at the same location as listed SAP for Site 16 South.

duplicate samples. In the laboratory, two portions of the sample are spiked with a standard solution of target analytes. MS and MSD samples are analyzed for the same parameters as the field samples, and analytical results will be evaluated for precision and accuracy of the laboratory process and effects of the sample matrix. The MSD/MS samples must be kept at sample MS and MSD samples are processed simultaneously with each analytical batch of 250 samples.

2.6.2.4 Surrogate Standards: Surrogates are chemical compounds with properties that mimic analytes of interest, but are unlikely to be found in environmental samples. Surrogates will be added to all field and quality control samples analyzed for volatile, analyzed by gas chromatography (GC) or gas chromatography/mass spectrometry (GC/MS) to assess the accuracy of the laboratory process, and to detect QC problems. The concentrations and type of the surrogate used will be based on the laboratory's Quality Assurance Plan.

2.6.2.5 Internal Standards: Like the surrogate standard, an internal standard is a chemical compound unlikely to be found in environmental samples that is added as a reference compound to the sample quantity/amount. Internal standard procedures are used for the analysis of volatile organic and semivolatile organic using GC/MS and also can be used for other GC and high performance liquid chromatography (HPLC) analytical methods. The concentrations and type of the internal standards used will be based on the laboratory's Quality Assurance Plan. The internal standard response and retention times must meet the method specific criteria for each compound class.

2.6.2.6 Method Blanks: Method blanks are designed to detect contamination of the lab samples that may occur in the laboratory. Method blanks verify that method blanks are caused by contaminants in solvents, reagents, glassware, and other sample processing hardware are known and recognized. Method blanks are processed once monthly with each analytical batch of 250 samples. A maximum of one method blank will be analyzed each day the field samples are analyzed at the rate of 1 per 20 field samples. A method blank must be analyzed daily. The concentrations of the target compounds in the method blank sample must be less than five times the method detection limit. If the blank is between the specified limit, the source contamination is to be identified and corrective actions taken.

2.7 Instrument/Equipment Testing, Inspection, and Maintenance

The field equipment and materials for this project is defined in Table 2-8. Testing, inspection, and maintenance requirements for field equipment are provided in Table 2-9.

Vehicle and its sub-contractors will provide all field equipment and parts for the field surveys and sampling, including digital global positioning system (DGPS), ranging devices, and a laptop (as well as accessories for the field sampling program). All equipment that collects sensitive data must be inspected and tested prior to use in the field. The maintenance records must be available for all field equipment in that facility during maintenance reports can be conducted in the field. Any problems with the operation of these tools during the survey must be documented, along with corrective action and the results of performance verification.

Field equipment maintenance will be documented in the field logs for the field/field maintenance used during field activities. Field equipment will be maintained when a major equipment failure or the need for maintenance. If a piece of equipment is repaired, a list of the field equipment maintenance will show telephone numbers, and points of contact will be maintained on the field activities. Field equipment routine maintenance may include the following:

- Inspecting surface dirt and debris

- Pay for high-leasing films, maintenance when needed
- Running proper storage of equipment
- Changing battery packs when not in use
- Maintaining spare and replacement parts in field to minimize downtime

The analysis of laboratory instruments (Standard Operating Procedures (SOPs) for analytical instruments that detail instrument testing, inspection and maintenance

2.3 Instrument/Equipment Calibration and Frequency

Methods for calibration of field equipment will follow the specific instrument manufacturer's recommendations. All field equipment (with the exception of the meter, level indicator and other equipment that cannot be field calibrated) will be calibrated to manufacturer's specifications before each day of use. A calibration check at the end of the day will be performed to verify that the instrument remained in good working condition throughout the day. If the calibration check at the end of the day does not meet acceptance criteria, then that day's data will be flagged; manufacturer's recommended corrective action will be performed; the instrument will be retested, and the instrument calibration check will remain in the operator's calibration that the instrument remains true to the initial calibration.

Table 2.3 lists the field equipment calibration procedures. Calibration information will be recorded in the field logbook. As a minimum, a listing specifying the scheduled date of the next calibration, make, model and make point of field equipment. If that information is not feasible, then a listing records for the equipment will be readily available for reference.

Should any of the field equipment become inoperable, it will be removed from service and tagged to indicate that repair, recalibration, or replacement is needed. The Field Team Leader will be notified so that prompt service or replacement equipment can be obtained. Backup systems will be available for the purpose of equipment in use and will be calibrated prior to use in the field.

Laboratory instrument calibration will be performed as specified in the method description. Specific laboratory calibration techniques are established for the U.S. EPA methods to demonstrate that the analytical instrument is operating in that the design specifications and the quality of the data generated can be replicated. Laboratory calibration and calibration verification will be conducted according to the frequency defined in the analytical methods and must meet the method criteria. In the event of an initial or continuing calibration failure, corrective action must be implemented and a new calibration performed to demonstrate that the system has returned to a control.

The analysis of laboratory instruments (SOPs for analytical instruments that detail instrument calibration procedures and calibration frequency

2.4 Inspection/Condition of Supplies and Consumables

Any supplies and materials be used in the sample collection process or instrument calibration, such as sample bottles, buffers, diluents, and calibration gases, will be inspected upon receipt and prior to use. The sample taking who should come with a certificate of acceptance. As a minimum, the Project Manager or a field team member will report the materials upon receipt for damage or broken seals.

Laboratory Testing Laboratories is required to purchase and/or provide equipment, materials, and supplies that meet or exceed the requirements of the project studies analytical methods. The laboratory will accept its supplier and manufacturer prior to their use in analysis.

3.06 Boundary Data

Historical reports and existing site photographs will be the only secondary data used to assist in identifying locations for near groundwater monitoring wells.

3.07 Data Management

The purpose of the data management section of this SAP is to describe the procedures that will be used to maintain data quality throughout the project. These operations include, but may not be limited to, data recording, data reduction, and data reporting.

3.07.1 Data Recording: All field observations and laboratory results will be linked to a unique sample location through the use of the sample identification system. Field observations and measurement data will be recorded on the field forms and on a field notebook to provide a permanent record of field activities. All data that are linked to each well will be subjected to a review by a second person to minimize data entry errors. A check performed by the Project Field Team Leader for completeness of field records (logbooks, field forms, sketches, sketches, spreadsheets) will ensure that all requirements for field activities have been fulfilled, complete records exist for each activity, and the procedures specified in this SAP have been implemented. Field documentation will ensure sample integrity and provide sufficient critical information to recreate each field event. The following documentation standards must be implemented for field and laboratory activities:

- Data must be documented directly, properly, and legibly. All reported data must be uniquely traceable to the raw data. All data reduction formulas must be documented.
- Handwritten data must be recorded in ink. All original data records include an appropriate description of the data collected, units of measurement, unique sample ID and station or location ID (if applicable), name (signature or initials) of the person collecting the data, and date of data collection.
- Any changes to the original raw data (copy must not obscure the original entry). The reason for the change must be documented, and the change must be initiated and dated by the person making the change, and approved.
- The use of pencil corrections, fluid, and erasable pen is prohibited.

3.07.2 Data Reduction: The data reduction procedures applied to reported data must be fully documented as follows:

- **U.S. EPA Method:** data are generated and final concentrations are calculated exactly as specified in the method.
- **Laboratory Quality Assurance Plan (LQAP):** The laboratory procedures, consistent with the U.S. EPA or other valid lab methods, are fully documented in the lab's controlling records.

- **SAP:** If environmental calculation is applied to the data and it is not documented in either the established method or the laboratory's standard procedures, then the full dimensional formula must be defined in the SAP.

3.51.3 Data Reporting. Hard copies of the data reports received from the laboratories will be filed chronologically and stored separately from the electronic files. Hard copies of data reported by a representative of the analytical laboratory will be compared to any electronic version of the data to confirm that the computer program has not modified the reports data. Any additional reporting formats will be a combination of electronic and hard copies will be stored in different locations at the facility for data.

3.51.4 Electronic Data Transfer. Following the data review process, Battelle will enter the sample results into an electronic database. This electronic database will be submitted to NAVFAC Southwest in Naval Electronic Data Exchange (NEDX) format and entered into the Navy Information Environment Information System (NIEIS) as described in current Environmental Work Instruction 86 (Environmental Data Management and Prepared Electronic Delivery Standards). Electronic databases will be reported to NAVFAC Southwest within thirty days of the receipt of the final data calculation report.

In addition, data will also be submitted electronically to the (California State Water Resources Control Board) (SWRCB) using the (Geographic) Environmental Information Management System (Geo Tracker) in accordance with Assembly Bill (AB) 2086. Data will be supplied with original and temporary qualified so that it will be possible to quickly plot or review changes in the concentration of target analytes through sampling point over time.

Section 3.6: ASSESSMENT/QUALITY REPORT

This section describes the field and laboratory assessment and response actions that may be conducted during this project, and the associated reports to management. These assessments conform to the assessment, quality assurance/quality control (QA/QC) activities outlined in Part IV of the Hudson Federal Facility Quality Assurance Project Plan (HQF-QAPP).

3.6.1 Assessment and Response Actions

Field data will oversee the collection of environmental data using the assessment and audit activities described in this section. Any problems encountered during an assessment of field or laboratory activities will require immediate action to ensure that the problem is corrected.

3.6.1.1 Field Assessments. At least one Technical Systems Analyst (TSA) of the field activities will be conducted by the Wildlife Program QC Manager or the Field Team Leader to assess compliance of activities with the Sampling and Analysis Plan (SAP) and to support data quality. During the field TSA, the assessment activities and interviews to determine if the procedures specified in the SAP are being implemented. The assessment will cover sample collection, identification, preservation, handling and shipping procedures, equipment calibration, maintenance, and documentation. Field data recording procedures, and general housekeeping. The assessment will use a checklist to document the TSA.

All observations and deficiencies will be documented in a TSA report. If deficiencies are noted, the TSA report will be sent to the Project Manager, Field Team Leader, and Program QC Manager. The Project Manager is required to respond in writing to any deficiencies. The Program QC Manager will verify that corrective action has been implemented.

3.6.1.2 Laboratory Assessments. Hudson Federal Engineering Service Center (HFESC) oversees all laboratories where there can analyze samples under HAW contracts. The assessment includes a review of laboratory certifications. Field data may conduct a TSA of the laboratory when a HAW approved laboratory has been selected for a contract, routine analysis or when a laboratory that is not on the approved list must be used. All laboratories are listed for use on the project are certified by the State of California Environmental Laboratory Accreditation Program.

3.6.1.3 Corrective Action. Corrective actions may be initiated by any of the participants of the data generation (field or laboratory analyst), reporting (laboratory director or field team leader), and verification process (Wildlife Program Manager or Program QC Manager).

For field measurements, if the final calibration check is outside acceptable limits, then the associated data collected that day will be flagged. On the following day, a single point continuing calibration check will be run after every five wells measured (or sample analyzed) to determine how long the next calibration is to be. Calibration frequency will be adjusted accordingly.

For laboratory measurements, if any of the QC checks (calibration, control spike recovery spike duplicate (MDMCD), laboratory control sample, or laboratory blank) are outside the acceptable criteria for accuracy, precision, and cross contamination, the laboratory will follow the corrective actions that are outlined in the Laboratory Quality Assurance Plan (LQAP).

3.2 Reports to Management

All observations and/or deficiencies noted during the field T&A will be documented on a T&A report. If deficiencies are noted, the T&A report will be issued to the Project Manager, Field Team Leader, and Program QC Manager. The Project Manager is required to respond in writing to any deficiencies. The Program QC Manager will then verify that necessary corrective action has been implemented.

If Battelle conducts a laboratory T&A, all observations and/or deficiencies will be documented on a T&A report. The T&A report will be issued to the Laboratory Director, Project Manager, and Program QC Manager. The Laboratory Manager is required to respond in writing to any deficiencies. The Program QC Manager will verify that necessary corrective action has been implemented.

Project reports prepared by Battelle will be submitted to the Naval Facilities Engineering Command (NAVFAC) Division through the Internal Project Manager (IPM). The schedule and submission requirements for submission of these reports following completion of project activities will be discussed accordingly. Table 3-1 summarizes the communication pathways including the reports that will be submitted for this project.

Section 4.0: DATA REVIEW

This section is devoted to the three steps describing the quality assurance (QA) activities that occur after the data collection phase of the project. These steps are data verification (step 1), data validation (steps 2a and 2b) and data workability assessment (step 3).

4.1 Data Verification (Step 1)

The verification step is a long process check that is performed before the data are reviewed to determine that all necessary documentation (the complete data package) has been collected and is available for review. Table 4-1 outlines the data verification processes for field and analytical data.

4.2 Data Validation (Steps 2a and 2b)

Data validation step 2a involves a comparison of the field and analytical data with methods, procedures and comments. Data validation step 2b is a comparison of the data with the measurement performance criteria outlined in methods, procedures, contracts and/or the Sampling and Analysis Plan (SAP). Table 4-2 outlines the validation procedures for the project.

4.2.1 Validation: The data generated for this project will be validated by Laboratory Data Consultants of Carlsbad, California, in accordance with EPA/ACF Southwest Environmental Health Institute (EWHI-81) (Chemical Data Validation). A 90% Level IV and 90% Level III data validation is required for this project.

4.2.1.1 Level-III Data Validation: Level III data validation involves checking initial data values are correct as reported. Data quality is ensured by verifying that the criteria defined in the SAP have been achieved for each sample result.

4.2.1.2 Level-IV Data Validation: Level IV data validation is based on the assessment of raw data packages, which include all data required for a full review and assessment of comp. anal. selection, sampling, measurement assessment, and quantification (e.g., spectra and chromatograms). Supporting materials also are included in the package (e.g., calibration standard, measurement sequence files, and dilution factors). Level IV data validation includes quantification of reported field and quality control (QC) sample results. In addition, measurement performance, calibration methods, and calibration standards are reviewed to ensure that the detection limits and data values are accurate and appropriate.

4.3 Data Workability Assessment (Step 3)

The Technical Project Manager as a representative with project team members will be responsible for the data workability assessment. The assessment will include the following activities:

- a. Data collected during the field efforts will be compared with the data quality objectives (DQOs) by preparing summary tables, charts, figures, or performing other type of data analysis that facilitates direct comparison of data collected through the course extent of the project.
- b. Comparisons will be made on a parameter specific basis, concentrating on the continuities of time and. Comparisons also will facilitate an analysis of contaminant concentration trends through time.

- The implications of any mean cyclelife (Q) results on the usability of the data will be evaluated
- The impact of any deviations (e.g., sampling technique, holding times, methods) on the usability of the data will be evaluated

The data reliability assessment will determine whether the data are acceptable to meet the project DQOs and whether additional sampling is required.

Section 5.6: RELEVANT REFERENCES

- Leachair Testing Laboratories: 2004. *Quality Assurance Manual for Leachair Testing Laboratories in Seattle*. Washington.
- San Diego County Department of Environmental Health (DEH): 2004. *Site Assessment and Management (SAM) Manual: Site Assessment and Mitigation Process*, San Diego, CA. Available at: www.sdcweb.org/ehd/sam/
- State Water Resources Control Board (SWRCB): 2007. *DST Program LGR 113*. Available at: http://www.swrchb.ca.gov/efilestate_gov/efilestate/L113files.html
- State Tech. PWR, Inc.: 2008. *Griff Site J4 South Program Report*. Prepared for Navy, Engineering and Construction Program Management Office. October 9.
- State Tech. PWR, Inc.: 2008a. *Final Site J4 South Corrective Action Plan (CAP) and Associated Work Plan: Former Naval Air Station Moffett Field, California*. Prepared for Naval Facilities Engineering Command Treatment Division. May 15.
- State Tech. PWR, Inc.: 2008b. *Addendum to Site J4 South Corrective Action Plan and Associated Work Plan*. Prepared for Naval Facilities Engineering Command Treatment Division. October 1.
- United States Department of Defense (DoD): 2006. *Quality Systems Manual for Environmental Laboratories*. Prepared by the DoD Environmental Data Quality Working Group. Department of Navy. Last Service. Final Version 2.
- United States Environmental Protection Agency (U.S. EPA): 2007. *Workbook for Uniform Federal Policy for Quality Assurance Project Plans: Evaluation, Assessment and Documenting Environmental Data Collection and Use Programs*. EPA/600/R-04/060. March.
- United States Environmental Protection Agency (U.S. EPA): 2006. *State Quality Objectives Process for Monitoring on Waste Site Investigations* (EPA/600/R-04/067). EPA/600/R-04/067. Prepared by the U.S. EPA's Office of Environmental Information. January. Available at: <http://www.epa.gov/epaospp/qobj/qobja.html>
- United States Navy: 1999. *Navy Installation Restoration Chemical Data Quality Manual*. EP 2099-01W. Prepared by, Naval Facilities Engineering Service Center. Revised September.

FIGURE

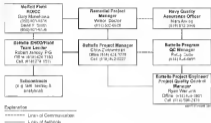


Figure 8-1 Project Organization Chart



Figure 3-3. Site Location Map

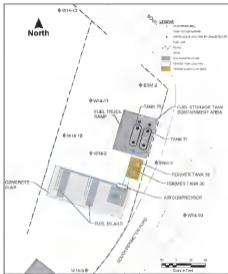


Figure 13. Side View

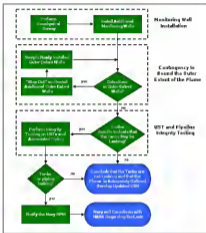


Figure 2-1. Flowchart Detailing Activities to be Performed at Site 14 South.

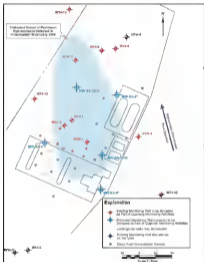


Figure 2.3. Proposed Locations for Installation of Additional Monitoring Wells and Quarterly Sampling Network

TABLE

**Table 1.1 Project Personnel Sign-Off Sheet
(OFF QAPP Worksheet #4)**

The purpose of this sign-off sheet is to document the key personnel responsible for implementing QAP activities (e.g., sample collection, sample shipment, sample analysis, QA/QC, data review) have used the QAP and understand the requirements prior to performing their duties.

Project Personnel	Organization	Title	Signature	Date QAPP Read
Chris Cummings	Petra Co.	Project Manager		
Ryan Winkels	Petra Co.	Project Engineer		
Jason Williamson	Petra Co.	Senior Technical Advisor		
Robert Jarry	Petra Co.	Field Team Leader/State Health and Safety Officer		
Wahne Amdur	Lander Testing Laboratories	Laboratory Representative		
Richard Smith	Laboratory Data Consultants	Data Validation Representative		

Table 1.3: Project Personnel and Project Responsibilities

Position	Responsibilities	Authority
U.S. Navy QA Officer Kathleen A. Long	<ul style="list-style-type: none"> • Oversight of QA on the entire project • Review and approval of S&P and all other QA/QC documents • Review of design process • Communication with Detach Program QC Manager • Communication of issues to the Navy ERM 	<ul style="list-style-type: none"> • Authorized to suspend field activities if QA requirements are not met
U.S. Navy ERM William Dwyer	<ul style="list-style-type: none"> • Final approval of contracts, including all field activities • Oversight of the overall TD 601P • Approval of selected subcontractors • Review of all contracts • Approval of the critical 12 field reports • Oversight of field and analytical activities 	<ul style="list-style-type: none"> • Authorized to suspend work for cause if data quality or staff safety are threatened
Detach ERMAC Program Manager Keith Fiedler	<ul style="list-style-type: none"> • Management of TD 601P contract • Assessment of personnel • Monitoring and control of cost, schedule, and QC • Compliance with regulations • Management of subcontractors • Liaison with Contracting Officer/Contracting Officer's Representative (COR/CORR) 	<ul style="list-style-type: none"> • Authorized to suspend work for cause if data quality or staff safety are threatened
Detach Senior Technical Advisor Tara W. Shivers	<ul style="list-style-type: none"> • Monitor and control cost, schedule, and quality • Support S&P/TAC PM in subcontractor recruitment and regulation/negotiations • Review compliance with all quality, environmental/health, safety, and security requirements 	<ul style="list-style-type: none"> • Work closely with Detach Program Manager to ensure efficient execution of TD 601P • Authorize a correction action, thereby recommending plans or change order requests for major scope changes • Assume Program Manager authority when necessary
Detach Project Manager Chris Zimmerman	<ul style="list-style-type: none"> • Management of budget and scheduling • Development of engineering design • Development of S&P and the Health and Safety Plan (HSIP) • Management of the field team • Reporting and planning • Issue requirements • Recommendation and justification for change orders • Coordination of subcontractor work 	<ul style="list-style-type: none"> • Approve budget • Approve all labor, materials, equipment, and subcontractor changes to the project • Assign technical and operational staff to the project • Approve all technical interventions, including the S&P
Detach Program QC Manager Ralph Coble	<ul style="list-style-type: none"> • Approval of QA/QC requirements • Review of data • Coordination of data collection • Interaction with Navy QA Officer • Certification of deliverables 	<ul style="list-style-type: none"> • Authorized to suspend work for cause if data quality is threatened

Position	Responsibilities	Authority
<p>Responsible for Health and Safety Officer (CHSO) and Health & Safety Team Leader</p> <p>Robert Jones, PG</p>	<ul style="list-style-type: none"> Review of the project SHEP Ensuring that the field personnel have received appropriate health and safety training for project work Ensuring all safety training documents for field personnel Oversight of sampling in accordance with the approved SAP Calibration and maintenance of field measurement equipment Compliance of field documentation Coordination of laboratory and field sampling activities Implementation of field correction scheme as required 	<ul style="list-style-type: none"> Authorized to suspend work if staff safety is threatened Authorise the scheme Ensure that all work is conducted in accordance with the Work Plan, SHEP and SAP
<p>Lead for Testing Laboratory</p>	<ul style="list-style-type: none"> Maintenance of sample chain of custody Ensuring that only staff trained according to the SAP work on the projects Implementation of the requirements of the SAP for sample analysis, instrument calibration, and data reporting Conducting corrective action for all failed QC, including reanalysis Maintenance of documentation sufficient to provide full data traceability Archiving of samples and data according to the SAP retention policy Consulting the Project Manager when decisions that could affect data quality are about to be 	<ul style="list-style-type: none"> Assign laboratory personnel Implement corrective action Report analysis results to Data Co
<p>Laboratory Data Consultants</p>	<ul style="list-style-type: none"> Review and assist, on personal selection, sample types, analysis method, equipment use and expected field and Q/L sample results Review instrument performance, calibration methods, and calibration standards to ensure that the detection limits and data values are accurate and appropriate Ensure that a calibration of individual analytes and detection limits were met Verify that a guard holding time or correction factor limit met Diagnose Q/L/QC problems associated with the sample results 	<ul style="list-style-type: none"> Assign analysis personnel Add guidelines to analytical results based on laboratory findings Report validation results to Data Co

Table 1.1. Data Quality Objective Steps for UST and Pipeline Integrity Testing

STEP 1 Identify the value	STEP 2 Identify the location	STEP 3 Identify the capacity in the location	STEP 4 Identify the measurement	STEP 5 Identify the test value	STEP 6 Identify the test value	STEP 7 Identify the test value
Will a calculation and comparison to existing information will be conducted within 14 days. If the results of comparison to existing information suggest that there is a link, it may be necessary to use USTs 70 and 71 to determine whether the party is acting as a source of information in the situation.	Each time a link is identified, the existing USTs and associated piping in the 14 days that a link is identified to determine if a link is present.	USTs 70 and 71 will be conducted to determine if a link is present.	Under the study boundary, a review of the use of the two values was that of USTs 70 and 71, the distribution, piping and the link values which are depicted in Figure 1.1.	Under the study boundary, a review of the use of the two values was that of USTs 70 and 71 will not be considered a continuing source of information in the situation.	Under the study boundary, a review of the use of the two values was that of USTs 70 and 71 will not be considered a continuing source of information in the situation.	Under the study boundary, a review of the use of the two values was that of USTs 70 and 71 will not be considered a continuing source of information in the situation.

Table 1-3. Analyte List, Precision, and Accuracy for Groundwater Samples

Analyte	Precision (% RPD)	Accuracy MS/MSD (% Recovery)	Accuracy MS/MSD (% Recovery)
TPH - 4.5 EPA SW-846 8160			
TPH R	50	62.150	91.60
TPH G	50	62.125	210.22
VOCs - 0.5 EPA SW-846 8160			
Benzene	50	65.130	96.120
Toluene	50	28.130	25.130
ETHYL-BENZENE	50	35.125	25.125
m,p-Xylene	50	35.130	25.130
Meta-Xylene (m-Xylol) other	50	65.125	65.125
Propylbenzene	50	35.140	35.140
Ortho-xylene (o-Xylol) other (TAMS)	50	65.125	65.125
Ortho-xylene (o-Xylol)	50	65.125	65.125
Benzyl-Toluene (BTOL)	50	65.125	65.125
Ortho-Xylene (TOL)	50	65.125	65.125

**Table 1-4. Project Documents and Records
(RFP-QAPP Worksheet #3)**

Document	Where Maintained
SAVES QAPP	Project File
Final investigation plan	Project File
Revised project setting matrices	Project File
Chain of custody forms	Project File
Laboratory raw data packages	Laboratory
Laboratory equipment calibration logs	Laboratory
Sample preparation logs	Laboratory
Instrumentation logs	Laboratory
Sample shipment records	Project File
Data collection reports	Project File
Analyst requests, check data reports	Project File and Laboratory
Final data review summary reports	Project File and Laboratory

Table 2.1 Monitoring Objectives and Construction Details for the Proposed Monitoring

Location	Well ID(s)	Monitoring Objective	Well Construction (Detail)
Source Area	• MW 26, 1520	Determine the aqueous concentrations and vertical distribution of TPH E, TPH G, and VOCs in the source area (i.e., the center of the former WS to which are likely the source of dissolved fuel in groundwater) at 10 to 14 depths.	Both the deep and shallow wells will have a screen of 2 inch PVC pipe flush-mounted at the ground surface. The shallow well will be screened from 15 to 30 ft bgs and the deep well will be screened from 30 to 50 ft bgs.
Control Area	• MW 26, 1520	Determine the aqueous concentrations and vertical distribution of TPH E, TPH G, and VOCs along the centerline of the groundwater plume at 10 to 14 depths.	Both the deep and shallow wells will have a screen of 2 inch PVC pipe flush-mounted at the ground surface. The shallow well will be screened from 15 to 30 ft bgs and the deep well will be screened from 30 to 50 ft bgs.
Lateral Bound ^a	• MW 26, 3 • MW 26, 4	Define the lateral extent of TPH E, TPH G, and VOCs in groundwater by collecting groundwater samples that are either non-detect or at low levels for these constituents.	Monitoring wells will have a screen of 2 inch PVC pipe flush-mounted at the ground surface, are used from 15 to 30 ft bgs.
Upgradient Bound ^a	• MW 26, 5	Define the upgradient extent of TPH E, TPH G, and VOCs in groundwater by collecting groundwater samples that are either non-detect or at very low levels for these constituents.	Monitoring well will have a screen of 2 inch PVC pipe flush-mounted at the ground surface, are used from 15 to 30 ft bgs.

^a If elevated levels of TPH E, TPH G, and/or VOCs are detected in the proposed monitoring wells, two additional monitoring wells may be installed at a location "upgradient" from the proposed well. The well with the elevated detection will be considered a monitor monitoring well and will be used to define upgradient boundaries along the centerline of the plume.

Table 2.2. Summary of Sampling Locations/IDs, Screened Interval, Sample Analysis and Sampling Procedures (UFP-QA/PF Worksheet #12)

Well ID	Screened Interval (ft depth)		Analytical Group	Sampling SOP Reference or QA/P Section
	Top	Bottom		
W14-1	10	31	TTH, VDOC	SAP Section 2.3.3
W14-2	10	31	TTH, VDOC	SAP Section 2.3.3
W14-3	40	40	TTH, VDOC	SAP Section 2.3.3
W14-3	15	25	TTH, VDOC	SAP Section 2.3.3
W14-4	15	20	TTH, VDOC	SAP Section 2.3.3
W14-5	40	50	TTH, VDOC	SAP Section 2.3.3
W14-11	5	20	TTH, VDOC	SAP Section 2.3.3
W14-11	10	20	TTH, VDOC	SAP Section 2.3.3
W14-11	15	20	TTH, VDOC	SAP Section 2.3.3
W16 SA, 10	10	15	TTH, VDOC	SAP Section 2.3.3
W16 SA, 15	15	20	TTH, VDOC	SAP Section 2.3.3
W16 SA, 20	20	25	TTH, VDOC	SAP Section 2.3.3
W16 SA, 25	25	30	TTH, VDOC	SAP Section 2.3.3
W16 SA, 3	15	20	TTH, VDOC	SAP Section 2.3.3
W16 SA, 5	15	20	TTH, VDOC	SAP Section 2.3.3
W16 SA, 7	15	20	TTH, VDOC	SAP Section 2.3.3

1. Due to a hole in the bottom of a screened well (W14-11) filled with sediment, the sampling for W14-11-15 was from a screen at the bottom of the well near the bottom of the screened interval (15 ft) to the bottom of the well (50 ft).

Table 2.3. Analytical Methods, Containers, Preservatives, and Holding Times (UFP-QA/PF Worksheet #13)

Matrix	Analytical Group	Analytical and Preservation Method	Containers (materials, size, type)	Preservation (chemical, temp, container, etc.)	Holding or Shipping Time (preservation/analytical)
GW	TTH, C	EPA 821-0-01-01150	1-40 mL glass vials	pH 2, 1:1 HCl, Cool, 4 ± 2 ° C	Extraction within 14 days/analysis within 60 days of extraction
GW	TTH, C	EPA 821-0-01-01150	1-40 mL glass vials	pH 2, 1:1 HCl, Cool, 4 ± 2 ° C	Extraction/analysis within 14 days
GW	VDOC	EPA 821-0-01-13420	1-40 mL glass vials	pH 2, 1:1 HCl, Cool, 4 ± 2 ° C	Analysis within 14 days

**Table 3-6. Reference Limits: Groundwater
(OFF-QAPP Worksheet #26)**

Analyte	CAL Number	Project Screen #1 Levels (ug/L)	Project QCLs (ug/L)	Analytical MDL (ug/L)
<i>Total Cr, Cr VI, Fe, Pb, Se, V, Mn, Ni, Cu</i>				
TOC-5	61394-28-5	100	125	35
TOC-10	61425-22-1	100	25	7.04
<i>As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, V, Zn</i>				
Asbestos	71-83-2	1.0	1	0.22
Barium	207-12-1	40	1	0.51
Beryllium	206-41-4	50	1	0.1
Total cadmium	74-40-1	20	5	0.43
Chloride (as chloride) (MMS)	61394-84-6	5	1	0.50
Cyanide ion	51-06-1	12	1	0.1
Cadmium (as cadmium) (MMS)	74-40-1	500	5	0.43
Cobalt (as cobalt) (MMS)	74-40-1	100	1	0.43
Copper (as copper) (MMS)	74-40-1	100	1	0.43
Chromium (as chromium) (MMS)	74-40-1	100	1	0.43
Chromium (as Cr VI) (MMS)	74-40-1	100	1	0.43

(a) West Beach Region 1 QCLs (2007) for groundwater are shown for a drinking water source.

QCL = quantitation limit

MDL = method detection limit

MMS = Manganese

**Table 3-8. Field Quality Control Sample Summary
(OFF-QAPP Worksheet #28)**

Matrix	Aspects of Group	Analytical and Preparation Method	# of Primary Samples, Location	# of Field Equipment	# of BSMWB	# of Trip Blanks	# of Equipment Blankets	Total # of Samples to Lab
GW	SO4-S	ISO 15700-04/05	10	3	1	3	3	20
GW	TOC-S	ISO 15700-04/05	10	3	1	3	3	20
GW	VOCs	ISO 15700-03/05	10	3	1	3	3	20

Blank numbers are based on each individual party's groundwater monitoring event.

Table 2-4. Measurement Performance Criteria- Field QC Samples
 (LEP-QAPP Worksheet #2)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Acceptance Error for Sampling QA Analytical QA or both (DQIs)
Field Triplicate	TRE, TPE, VDE	10% of QM samples	Precision	RSD \leq 10% when between the field triplicate	± 5%
Spiked Matrix	TRE, TPE, VDE	1 per sampling day	Accuracy/Bias	Evaluate using 3 results against analytical percent to bias to determine impact on sample results	± 5%
Spig Blank	TRE, TPE, VDE	1 per round of QM samples	Accuracy/Bias	Evaluate sample results against analytical percent to bias to determine impact on sample results	± 5%
Source Blank	TRE, TPE, VDE	1 per source of decontamination water	Accuracy/Bias	Evaluate sample results against analytical percent to bias to determine impact on sample results	± 5%
Temperature Blank	NA	1 per round	Accuracy/Bias	4°C ± 2°C	5

Table 2.1. Quality Control, Acceptance Criteria, and Corrective Action

QC Sample Type	Acceptance Criteria	Corrective Action
Method Blank	<1 - MDL	Provide a control by method. Correct the return for extraction, transfer(s) or purification, if relevant.
LODL/CSD In-house	See Tables 1.3 and 1.4	Investigate the problem, correct the problem, and reanalyze affected samples or purification document.
Process Standards	Defined by Analytical Method and Laboratory SOPs	Investigate the problem, correct the problem, and reanalyze affected samples or purification document.
Organic Surrogates	Control Limits (±SD)	Investigate the problem, correct the problem, and reanalyze affected samples or purification document.
Calibration	Defined by Analytical Method and Laboratory SOPs	Investigate the problem, correct the problem, and recalibrate.
Calibration Check	Defined by Analytical Method and Laboratory SOPs	Investigate the problem, correct the problem, recalibrate, and reanalyze affected samples.

Table 3.E. Field Equipment Calibration, Maintenance, Testing, and Inspection

QEP-QA-FP Worksheet 408

Field equipment	Calibration/Inspection frequency	Frequency	Acceptance Criteria	Pass/Fail criteria	Responsible person	QEP Reference	Routine Maintenance
Water D-30's were used for D (VOCs) Inspections/characterization/ pH	Annually factory calibration of pH sensor as calibration standard. Monthly D-30's used at study events will be calibrated with water retention. The temperature sensor will be calibrated with a Maxcoil Institute of Standards and Technology (NIST)-certified trace water QEP.	Annually/ Monthly	Hydrion technology sensor, uncalibrated, using known buffer as calibration standard	If the equipment does not meet acceptance criteria, use new item, ensure it is calibrated the week the report	Field Team Leader	QAP Section 3.6 and 3.7	Download data onto a tablet and verify no manual errors. Replace battery as needed. Clean sensors if clogging is needed
Battery CNA, L2E PDS for expansion, for engine, report	Check against standard. Factory calibration is needed	Daily/Collection, not used daily	40% of standard/gauge	If the equipment does not meet acceptance criteria, use new item, ensure it is calibrated the week the report	Field Team Leader	QAP Section 3.6 and 3.7	There is protection cover selection to use. Check power supplies and a connection point to use. Annual contact with vendor or other as needed
Water Level from site	Monthly/Check against gauge with flow rate gauge as calibration/accuracy	NA	0.1% (1-in) accuracy	If the equipment does not meet acceptance criteria, use new item, ensure it is calibrated the week the report	Field Team Leader	QAP Section 3.6 and 3.7	Do not contact between two N replace battery as needed

**Table 2-1: Communication Pathways
(OFF QAPP Worksheet #6)**

Communication Desired	Responsible Entity	Route	Phone Numbers	Procedure (Timing, Pathways, etc.)
Monthly briefings to HAYFAC ERM	Walla De Project Manager	Close Communication or disagree	814-424-3779	Monthly (regardless of project status) at the end of each month.
Regular communication with HAYFAC ERM	Walla De Project Manager	Close Communication or disagree	814-424-3779	Communication via phone calls and/or e-mail to discuss status and any issues.
Sample receipt notifications	Leach's Project Manager	DED	888-387-1800	E-mail notifications of sample receipt, chain of custody review.
Data report to HAYFAC ERM	Walla De Project Manager	Close Communication or disagree	814-424-3779	Data report summarizing all sampling data and conclusions.
Quality Assurance Reports	Walla De Program QA Manager	Direct-Data or disagree	814-424-4879	Writing QA reports submitted to the Walla De ERM to include any address the engineering firm's development costs and document corrective action.
Regular communication with HAYFAC QA Officer	Walla De Program QC Manager	Direct-Data	814-424-4879	Communication via phone calls and e-mail to obtain approval of the planning documents (e.g., SAP) and to discuss project costs and any issues.

**Table 4-1. Verification Process
UEP-QA/QC Worksheet 408**

Verification Item	Description	Interval Frequency	Responsible for Verification (Name, Organization)
Chain of custody forms	Chain of custody forms will be reviewed upon completion and verified against the master contents prior to disposal. A copy of the chain of custody forms will be retained in the project file, and the original will be placed inside the container disposal.	1, 2	Items in the B Team Leader and Laboratory Manager
Field logs etc.	Field notes will be reviewed internally and placed in the project file.	1	Items in the B Team Leader
TGA	At least one TGA of the field activities will be conducted to assess any losses of activities with the BAF and to support data quality. The master will review sample collection, identification, preservation, handling and shipping procedures, equipment collection, maintenance, and documentation, field data recording procedures, daily, internal to management.	1	Items in the Field Team Leader, Satellite Project Manager or Items in the Program QC Manager
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to shipment. The laboratory will document the organization and contents of each data package. All received data packages will be verified internally for completeness after receipt.	1, 2	Laboratory Manager and Items in the Program QC Manager

Table 4.2. Validation Steps 1a and 1b Process (QAPP-QA PP Worksheet #2B)

Item #/Step	Validation Step	Description	Responsible for Validation (with assignment)
1a	Analyses	States that the required analyses were completed as specified in contracts, protocols or contracts	Laboratory Manager, Data Validator
1b	Chain of Custody	Ensures traceability of the data from time of collection through reporting Formal COT documents against methods, procedures or contracts	Laboratory Manager, Data Validator
1a	Sampling Methods and Procedures	States that sampling methods were followed and any deviations were documented	Responsible Field Team Leader
1b	Sample Handling	States that sample handling, receipt and storage procedures were followed and any deviations were documented	Responsible Field Team Leader, Data Validator
1a	Analytical Methods and Procedures	States that the required analytical methods were used; any deviations were noted	Laboratory Manager, Data Validator
1a	Data Qualifiers	Determines that laboratory data qualifiers were defined and applied as specified in methods, protocols or contracts	Laboratory Manager, Data Validator
1a	Standards	Determines data standards were included and that the methods (comparisons)	Laboratory Manager, Data Validator
1a	Step 1a: Validation Report	Summarizes deviations from methods, procedures or contracts. Includes qualified data and explanation of all data qualifiers	Laboratory Manager, Data Validator
1b	Sampling Plan	Determines whether the SLP was executed as specified (e.g. the location, location and type of field samples were collected and analyzed as specified in the SLP)	Field or Program QC Manager
1b	Sampling Procedures	Reviews whether sampling procedures were followed with respect to equipment and sample handling (e.g. techniques, equipment, ice, contamination, volume, transportation, preservation, etc.)	Responsible Field Team Leader
1b	Holding Times	States that samples were analyzed within holding times specified in contracts, protocols or contracts and any deviations were documented	Field or Program QC Manager, Data Validator
1b	Field Replicates	Compares results of field replicates with criteria in the SLP and documents any deviations	Field or Program QC Manager
1b	Range or Quantitation Limit	Determines that quantitation limits were achieved as outlined in the SLP	Field or Program QC Manager
1b	Performance Criteria	Reviews QC data against project specific performance criteria (e.g. precision, accuracy, repeatability, recovery, sensitivity, sample volume and stability)	Field or Program QC Manager
1b	Step 1b: Validation Report	Summarizes outcome of comparison of the data to standard performance criteria in the SLP	Field or Program QC Manager

ATTACHMENT 3

FINAL

**SITE HEALTH AND SAFETY PLAN
FOR ADDENDUM NO. 2 TO SITE 14 SOUTH CORRECTIVE ACTION
PLAN AND ASSOCIATED WORK PLAN FOR UNDERGROUND
STORAGE TANK INTEGRITY TESTING AND ADDITIONAL SITE
ASSESSMENT ACTIVITIES**

**FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA**

**Contract No. 680791 01 D 0100
Task Order No. 0017
DCE R&TL 0000 0017 0000**

Prepared for:

**HEAC PMO West
1400 Fraser Road, Suite 400
San Diego, CA 92108**

Prepared by:

**Battelle
Environmental Sciences Department
365 King Avenue
Columbus, Ohio 43261**

February 12, 2008

APPROVAL PAGE

FINAL

SITE HEALTH AND SAFETY PLAN
FOR ADDENDUM NO. 3 TO SITE 14 SOUTH CORRECTIVE ACTION
PLAN AND ASSOCIATED WORK PLAN FOR UNDERGROUND
STORAGE TANK INTEGRITY TESTING AND ADDITIONAL SITE
ASSESSMENT ACTIVITIES

FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA

Contract No. M0711-00-B-0009
Task Order No. 0017
DCA B-111-0009 0017 0003

February 13, 2008

Battelle Project Manager


Mr. Christian Plumb

Date 2/12/08

Battelle CTH


Mr. Brian Hunsch CTH

Date 2/12/2008

CONTENTS

FIGURES	iv
TABLES	iv
ABBREVIATIONS AND ACRONYMS	vi
DISTRIBUTION LIST	vii
Section 1-0 ADMINISTRATIVE INFORMATION	1
1.1 Project Description	1
1.2 Scope of Site Health and Safety Plan	1
1.3 Key Personnel and Responsibilities	3
1.3.1 Project Manager Responsibilities	3
1.3.2 HSE/CHEP Responsibilities	4
1.3.3 SHEO Responsibilities	4
1.3.4 Project Field Staff Responsibilities	5
1.3.5 Subcontractor Responsibilities	5
1.3.6 Site-Specific Safety Meeting	6
Section 2-0 PROJECT TASKS	7
Section 3-0 HAZARD/HAZARD ASSESSMENT	8
3.1 Hazards Associated with LIFT Pipe Integrity Testing	8
3.2 Hazards Associated with Potable Tanks	8
3.2.1 Hazards Associated with Hydroblasting and Demolition	28
3.2.2 Hazards Associated with IDW Drilling	28
3.2.3 Hazards Associated with Soil Boring and Wall Installation	28
3.2.4 Hazards Associated with General Water Sampling	28
3.3 Hazards Associated with Potable Water Hydrants	28
3.4 Hazards Associated with Volatile Organic Compounds	28
3.4.1 Benzene	28
3.4.2 Ethylbenzene	29
3.4.3 Toluene	29
3.4.4 Xylene	29
3.4.5 Methyl tert-butyl Ether	29
3.5 Hazards Associated with Heavy Equipment	29
3.6 Slip-Trip-Fall Hazards	29
3.7 Lifting Hazards	30
3.8 Tool and Equipment Hazards	30
3.9 Heat Stress Hazards	31
3.10 General Site Safety	31
3.11 Biological Hazards	31
Section 4-0 SITE CONTROL	33
4.1 Work Area Control	33
4.2 Decontamination Control	33
Section 5-0 PERSONNEL PROTECTION	34
5.1 U.S. EPA Levels of Protection	34
5.2 Air Monitoring Procedures	35

Section 6.0	GENERAL SAFETY RULES	38
6.1	Recommended Equipment Safety Guidelines	38
6.2	General Safety Person Role and Groundwater Sampling	38
6.3	Decommission Safety	37
Section 7.0	EMERGENCY PROCEDURES	39
7.1	Communication	39
7.2	Site Evacuation Procedures	39
7.3	First Aid	39
7.4	Decommissioning During Medical Emergencies	41
7.5	Emergency Assistance	42
Section 8.0	SPILL AND DISCHARGE CONTROL	44
Section 9.0	MEDICAL SURVEILLANCE	45
9.1	Contents of Medical Examination	45
9.2	Personal Logging	45
Section 10.0	TRAINING	46
Section 11.0	ADVERSE WEATHER CONDITIONS	47
Section 12.0	REFERENCES	48
ATTACHMENT 1 ACCIDENT PREVENTION PLAN		
ATTACHMENT 2 HEALTH AND SAFETY FORMS		
ATTACHMENT 3 DRILLING SAFETY GUIDE		
ATTACHMENT 4 MATERIAL SAFETY DATA SHEETS		
ATTACHMENT 5 BATTLE TRAINING DOCUMENTS		

FIGURES

Figure 6.1	Site Location Map	5
Figure 7.1	Hospital Route to St. Camille Hospital	29
Figure 7.2	Map Showing Location of Decommission Assembly Area	40

TABLES

Table 3-1	Activity/Manual Analysis	8
(1)	Mobilization	8
(2)	Integrity Testing of CUTE and Associated Piping	10
(3)	Soils, Leachate and Mud/Urine	11
(4)	Monitoring Well Installation	12
(5)	Well Development	13
(6)	Equipment Decommissioning	13
(7)	Site Removal and Disposal	20
(8)	Monitoring Well Location Survey	23
(9)	Groundwater Sampling	24

(10) Dermal Absorption	37
Table 3-2 Primary Health Hazards and Exposure Limits for Chemical Substances at Moffett Field	38
Table 3-3 Signs and Symptoms of Heat-Related Illnesses and Treatments	38

ABBREVIATIONS AND ACRONYMS

ACGMH	American Conference of Governmental Industrial Hygienists
AHA	Airway Hazard Analysis
ANRI	American National Standards Institute
APP	Accident Prevention Plan
CITR	Code of Federal Regulations
CIS	Certified Industrial Hygienist
CMT	Construction Management Tech.
CPR	cardiopulmonary resuscitation
DE	Delayed
EM	Emergency Manual
EMS	Emergency Medical Services
ESHAHQ	Environment, Safety, Health, and Quality
ESD	Flame ionization detector
GCFC	ground fault/circuit interrupter
HEPA	high-efficiency particulate air
HSC	Health and Safety Officer
EDW	energy-absorbing waste
IR	Installation Restoration
MSDS	Material Safety Data Sheet
MTA	Mass Towing Association
MTSE	medical-tert triage station
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protection equipment
ppm	parts per million
POCCC	Resident Officer on Charge of Construction
PPM	Residential Project Manager
SAP	Sampling and Analysis Plan
SHSO	Site Health and Safety Officer
SHSP	Site Health and Safety Plan
SSO	Site Safety Officer
STEL	short-term exposure limit

TLV	Threshold Limit Value
TTH	total petroleum hydrocarbons
TWA	time-weighted average
USACE	United States Army Corp of Engineers
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UV	ultraviolet
VOC	volatile organic compound
WATS	Wastewater Aqueous Treatment System

CONTRIBUTORS LIST

The following persons will be provided copies of the approved Site Health and Safety Plan (SHSP) and any subsequent revisions:

Title	Name and Contact Information
U.S. Navy Remedial Project Manager (RPM)	William Docter NAVFAC Southwest PSCC PMO West 1403 Fresno Road, Suite 100 San Diego, CA 92161 (619) 333-0808 william.docter@navy.mil
Resident Officer-in-Charge of Construction (ROICC)	Mr. Gary Mordikawa ROICC Moffett Federal Airfield Bldg. 337 Moffett Field, CA 94035-0008 (650) 803-0834 gary.mordikawa@navy.mil
Construction Management Team (CMT)	David S. Smith ROICC Moffett Federal Airfield Bldg. 337 Moffett Field, CA 94035-0008 (650) 803-0830 david.s.smith@navy.mil
Battelle Project Manager	Christian Zimmerman Battelle Memorial Institute 305 East Ave Columbus, OH 43208 (614) 624-2775 zimmerc9@battelle.org
Battelle Field Team Leader Site Health and Safety Officer (SHSO)	Robert January Battelle Memorial Institute 305 East Ave Columbus, OH 43208 (614) 624-7380 Mobile (614) 779-1311 januaryr@battelle.org
Battelle Project Engineer/Project Quality Control Manager	Pyra Wismar Battelle Memorial Institute 305 East Ave Columbus, OH 43208 (614) 624-3831 Mobile (614) 555-2175 wismarp@battelle.org

Title

Name and Contact Information

Water Resource Control Engineer

Kimberly E. Wells
Regional Water-Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
(510) 432 2490
ewells@waterboards.ca.gov

U.S. EPA Project Manager

Alana Lee
EPA Region 9
75 Hawthorne Street, 9th Fl. 940
San Francisco, CA 94105
(415) 572 0541
Lee.Alana@epa.gov

Section 1.0 ADMINISTRATIVE INFORMATION

This Site Health and Safety Plan (SHEP) is written for the performance of underground storage tank (UST) line integrity testing and additional site assessment work to delineate the lateral and vertical extent of petroleum constituents in groundwater at Site 14 South Moffett Field, California. This SHEP is intended to meet the requirements of:

- United States Army Corps of Engineers (USACE) Safety and Health Manual EM 1185-2-1 (USACE, 2000)
- 29 Code of Federal Regulations (CFR) 1910 and 29 CFR 1926
- United States Environmental Protection Agency (U.S. EPA) Standard Operating Safety Guidelines for Hazardous Waste Operations (U.S. EPA, 1992)
- Navy/Marine Corps Installation Activities (SIO Manual) August (U.S. Navy, 2000)
- California Code of Regulations Title 8 Section 5152.

1.1 Project Description

Moffett Field is located near the southern end of San Francisco Bay in Santa Clara County, California. It is located by railroad approximately 30 miles to the north, Serrano Creek to the west, U.S. Highway 101 to the south, and Lockheed Martin Space Systems property to the east (see Figure 1.1).

The objective of this effort is to perform UST line integrity and leak testing on the existing USTs at Site 14 South to determine if an ongoing leak is occurring. Subsequently, additional groundwater monitoring wells will be installed and sampled along with selected existing wells to adequately delineate the extent of groundwater petroleum present at the site.

1.2 Scope of Site Health and Safety Plan

This SHEP and associated Accident Prevention Plan (APP) (see Attachment 1) have been prepared for use by Battelle project personnel and Battelle subcontractors for work at Moffett Field. The plans are written for the specific site conditions, purposes, tasks, dates, and personnel. If these conditions change, these plans must be amended and approved by those named in Section 1.3.

All site activities will be performed in accordance with the documents listed above, especially 29 CFR 1910.120. Work at Moffett Field is expected to begin in late summer 2007 and will consist of performing integrity tests for two USTs and associated piping, locating underground utilities, installing seven additional monitoring wells, surveying elevations and lateral coordinates for all newly installed wells, and conducting groundwater sampling of the newly installed wells and select wells that currently exist at the site. All Battelle employees involved in fieldwork at Moffett Field will have completed the required training programs and maintained qualifications through annual refresher training. They are also under a program of medical surveillance and are entitled to wear respiratory protection as specified in 29 CFR 1910.134. Full details of the Battelle safety training, Respiratory Protection, and Medical Surveillance Programs are given in the Battelle Environment, Safety, Health, and Quality (ESHQ) Q

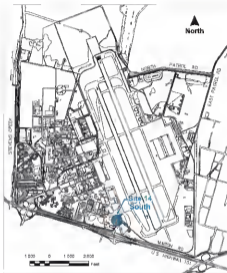


Figure 3-1. Site Location Map

Training Program (Battelle 3004a), Respiratory Protection Program (Battelle 3004b), and the Chemical Safety Information Program - Medical Consultation (Battelle 3005c) respectively. Attachment 5 contains copies of Battelle training programs and standard respiratory procedures that are relevant to Site 14 South.

This SHEP was prepared from the best available information concerning site conditions. The health and safety specifications in this SHEP are based on reasonable knowledge that petroleum hydrocarbons, including petroleum-based flow product, are likely to be encountered during drilling and general water sampling activities. Unless specified in this SHEP, the field team does not have the option to modify the levels of personal protection in any way.

1.3 Key Personnel and Responsibilities

Key Battelle personnel for this project include:

- Battelle Project Manager - Chris Zimmerman
- Battelle Contract Technical Support (CTTS) and Health and Safety Officer (HSEO) - Howard Himmelsbach
- Battelle Field Team Leader and Site Health and Safety Officer (SHSO) - Robert J. Jurek
- Battelle Project Engineer and Project Quality Control Officer - Ryan Wrensch

All project field staff, including subcontractor personnel, have completed competencies in health and safety training, which meets the requirement of 29 CFR 1910.120. The SHSO or the alternate HSEO will have:

- Completed the required training for the project assignment.
- The responsibility for completing the required field forms and reports.
- The authority to modify and stop work, or remove personnel from the site if working conditions affect on-site and off-site health and safety.
- First Aid and cardiopulmonary resuscitation (CPR) certifications and blood-borne pathogens control training.
- Completed the 40 hour Occupational Safety and Health Administration (OSHA) Hazardous training and taken the current 8-hour annual refresher.

Specific project safety responsibilities for these key personnel are detailed below.

1.3.1 Project Task Manager Responsibilities. The Battelle Project Manager, Chris Zimmerman, is responsible for overall management of the task, including technical and financial program tracking; providing reports to the Navy and justification of project reports. He is responsible for generating organizing and completing the SHEP, which describes planned field activities and potential hazards that may be encountered at the site. Mr. Zimmerman also is responsible for ensuring that adequate training and site safety briefings, including the provision of safety equipment, are provided to the project field staff. He will provide a copy of the SHEP to each member of the project field staff and one copy to each subcontractor prior to the initiation of field activities. Associated health and safety responsibilities will include:

- Coordinating the activities of all field personnel, including those required as direct employees of the SHEP
- Selecting a SHEP and field personnel for the work to be undertaken on-site
- Ensuring that the assigned tasks are being completed as planned and are kept on schedule
- Providing authority and resources to ensure that the SHEP is able to implement and manage safety procedures
- Preparing reports and recommendations about the project to the client and concerned personnel
- Ensuring that the SHEP is aware of all personnel of the SHEP and that all on-site personnel are instructed about safety practices and emergency procedures as defined in the SHEP
- Ensuring that the SHEP is maintaining site safety

1.3.2 HSEQ/ECR Responsibilities. The Satellite HSEQ/ECR Mr. Thomas Hornsdelbach, is responsible for developing and coordinating the health and safety program outlined in this SHEP. He also is responsible for reviewing and approving the SHEP for accuracy and incorporating any new information or procedures that add the Project Manager and SHEP or further definitions and control of the potential health and safety hazards associated with the project. Mr. Hornsdelbach also has the authority to suspend or modify work practices for safety reasons and to discuss individuals whose site conduct endangers the health and safety of others.

1.3.3 SHEP Responsibilities. The SHEP Mr. Robert Janczy will be the competent person on site, has a direct line of authority to implement specific health and safety requirements for specific site activities, and is responsible for ensuring that all team members, including subcontractors, comply with the SHEP. Mr. Janczy will review the Activity Hazard Analysis (AHA) and the corresponding equipment safety checklist for definable features of work to be completed on a given day with the associated field team members at the beginning of each day. It is also Mr. Janczy's responsibility to inform the subcontractors and other field personnel of chemical and physical hazards or he becomes aware of them. Also, Mr. Janczy will contact the nearest emergency response organization – the NASA Ames Fire Department located at 590 Zeeb Road. Mr. Janczy has the authority to suspend work if he feels the operations threaten the health and safety of the field team or the surrounding population. Mr. Janczy or his designee is responsible for completing and submitting the following forms, which are included in Attachment C to this document.

- Safety Compliance Agreement Form
- Tailgate Safety Meeting Form
- Air Monitoring Data Sheet
- Accident/Incident Analysis Form

Additional SHEP responsibilities include, but are not limited to, the following:

- Evaluate weather conditions and chemical hazard information, and making recommendations to the Project Manager about any modifications to this SHEP or personal protection equipment (PPE) requirements to maintain personnel safety

- Assessing all field personnel working onsite, taking into consideration their level of training, their physical capacity and their ability to wear protective equipment necessary for the assigned tasks
- Ensuring that a copy of the Final Site Health and Safety Plan is left on-site at all times for review and use by all site personnel and visitors
- Monitoring the compliance of field personnel for the selection and proper use of protective equipment that has been required for each task
- Refueling the "buddy system" as appropriate for site activities
- Posting locations and routes to the nearest medical facility and arranging for emergency transportation to the nearest medical facility
- Posting the telephone numbers of local public emergency services
- Observing field team members for signs of exposure, injury or other conditions related to pre-existing physical conditions or site work activities

1.1.4 Project Field Staff Responsibilities. The project field staff is responsible for ensuring that activities are performed in accordance with the approved SHEP and that deviations from the SHEP are based upon documented field conditions that are well-documented in field notes. Figure 1-1 presents the organization chart for the Site 14 South project team. The health and safety responsibilities of the project field staff include:

- Following the SHEP and the direction of the SHEO
- Reporting any unsafe conditions or practices to the SHEO
- Reporting all facts pertaining to incidents that require agency response to those materials to the Project Manager and SHEO
- Reporting to the Project Manager on all equipment malfunctions or deficiencies
- Reversing the SHEP as necessary

It is the responsibility of individual organizations involved in field activities to ensure understanding of and compliance to the SHEP by its on-site employees or any contractors working as controlled access. Failure by any person to adhere to the SHEP may result in their removal from the site.

1.1.5 Subcontractor Responsibilities. Battelle is the lead contractor for all project activities and therefore is responsible for site health and safety concerns on-site, as well as air clearances for possible containment exposures. Battelle will inform subcontractors of the site emergency response procedures and any potential fire, explosion, health, safety or other hazard by making the SHEP and site information available on-site. The Battelle SHEO will ensure safety compliance of all subcontractors through the duration of field activities. Subcontractors will be held responsible by Battelle for the following:

- Attending the health and safety meeting given by the SHEO covering the requirements of the SHEP

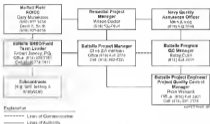


Figure 1.2 Project Organization Chart

- Providing documentation that their employees have been health and safety trained in accordance with applicable federal, state and local laws and regulations;
- Providing their own company provided PPE
- Providing evidence of medical surveillance and medical approvals for their employees
- Designating their own Site Safety Officer (SSO) responsible for ensuring that their employees comply with their own SHEP making their SHEP available for review by Satellite and taking any other of internal measures required by their own activities
- Signing the Safety Compliance Agreement (Form A Attachment 2) as a part of standard safety protocol. All field personnel performing on-site work will sign the Safety Compliance Agreement Form. Individuals who refuse to sign this agreement will be prohibited from working on this project.

1.2.8 Site Safety and Safety Meeting. A site specific on-site safety meeting will be held daily prior to the start of any site activities at Site 14 South, Moffett Field and at other times as necessary to ensure that all field personnel and visitors are aware of the health and safety hazards at the site. All field personnel, including subcontractors, will be required to attend the safety meeting and all field personnel will sign the Safety Meeting Form (Attachment 3) at the completion of the meeting. The SSO will brief all personnel and present details contained on the LHA for the tasks that will be performed that day. Also, bottled water will be made available to field personnel as necessary and personnel will be instructed to use the nearest public restroom for sanitation needs during field work. The Resident Officer in Charge of Construction (ROICC) will be provided with copies of the daily logs in meeting signature forms upon request.

Section 3.0: PROJECT TASKS

The major Details tasks associated with this contract include the following:

- Mobilization.
- Underground storage tank (UST) system integrity testing*
- Site, locate and mark utilities*
- Installation of monitoring wells*
- Well development*
- Equipment decontamination
- Investigation/Removal of site (OTR) transport and disposal *
- Location survey of ground water monitoring wells*
- Groundwater sampling
- Demobilization.

*These tasks listed are completed by a third subcontractor.

The Details site health and safety officer (SHSO) will ensure safety compliance of all subcontractors throughout the duration of field activities and will ensure the subcontractor safety requirements for the loading of soil barrels and installation of monitoring wells. This Health and Safety Plan (SHSP) from subcontractors will be made available for review by Details prior to start of site work to ensure that each SHSP covers all aspects of the subcontractors' responsibilities for this project. The hazard risk assessment presented in the following section is for addressing potential risks that Details field personnel and subcontractors might encounter while working on-site during the UST integrity testing, soil boring/drilling, monitoring well installation, and groundwater sampling. Subcontractors are expected to follow their individual SHSPs as well as protocols included in the SHSP.

Work at Mill-Cr. Field is expected to begin in January 2008 and is expected to last approximately 14 working days.

Section 2.4- HAZARD/RISK ASSESSMENT

This section discusses chemical, physical, and environmental hazards to on-site workers. Section 2.1 discusses hazards associated with the project tasks listed in Section 2.3. Section 2.2 discusses the potential hypotheses of potential concerns and includes information such as exposure limits and signs and symptoms of exposure. Section 2.3 discusses the volatile organic compounds (VOCs) of potential concerns and includes information such as exposure limits and signs and symptoms of exposure. Sections 2.4 through 2.8 discuss physical hazards associated with this site including those associated with fire, use of heavy equipment, slip-to-fall, lifting, tool and equipment, and hot steam. Section 2.11 discusses biological hazards associated with the physical location of the site including contact with flora and fauna.

Permissible exposure limits (PELs) are established by Occupational Safety and Health Administration (OSHA) permissible exposure limits for specific airborne concentrations of toxic substances measured as an 8-hour time-weighted average (TWAA). The OSHA PELs are the recognized levels to which the site monitoring will adhere. Short-term exposure limits (STELs) established by OSHA are OSHA short-term limits measured as a 15-minute TWAA. OSHA requires that controls be implemented when employee exposure exceeds these limits. The Threshold Limit Value (TLV) are health and safety guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). If contaminant levels exceed 80% of the TLV TWAA or PEL TWAA and persist for longer than 30 minutes, engineering and/or administrative control measures will be implemented. During UST testing, drilling, and sampling, and groundwater monitoring activities, field personnel have the potential of being exposed to contaminated soil and groundwater and/or contaminants in the vapor phase.

Daily job site safety meetings will be held at the start of each workday to discuss potential chemical, physical, and environmental hazards and preventative safety measures. A third party will be mandatory for all employees and a Tailgate Safety Meeting Form (Attachment 2) will be completed. A Job Safety Analysis (JSA) have been developed for each major field activity/work phase and are presented in Table 2-1. The following subsections describe in more detail the specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard. This information will be used to implement daily safety meetings related to hazards safety and hazard awareness on the job.

2.1 Hazards Associated with UST Pipe Integrity Testing

ASAs have been developed for the various hazards possible with Underground Storage Tank (UST) and preliminary testing and are presented in Table 2-1. The main hazards involved include the release of fuel during testing, over-pressurizing the product line during testing, and the possibility of dispensing equipment leaking fuel due to over-pressurizing the line.

2.2 Hazards Associated with Battelle Tests

ASAs have been developed for each major field activity/work phase and are presented in Table 2-1. These major tasks include: (1) Mobilization, (2) Underground Storage Tank (UST) piping integrity testing, (3) Flow, locate and track studies, (4) Installation of monitoring wells, (5) Well development, (6) Equipment decontamination, (7) Inventory phase-related wells (IDW) transport and disposal, (8) Location survey of groundwater monitoring wells, (9) Groundwater sampling, and (10) Demobilization.

Table 3.1 Activity Hazard Analysis

10. MIG WELDING		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
1. Mobilization (Site Set-Up)	Stability Equipment	All equipment, supports, rods and tools will be properly secured during transport.
	Overable Drill Rig	Never move the drilling rig while the mast is in the 3rd stage unless leveling jacks, but on moving the mast. Never place outriggers over unstable surfaces. Verify allow limit jacks etc. Never place jacking pins in soft or position ground conditions.
	Lifting Up Equipment	Use a ground grade along with a functioning back up chain during equipment lifting.
	Electrocution	Inspect the ground and overhead utilities in the vicinity of the drilling location. A drilling clearance permit shall be obtained from local government or utility companies prior to starting activities on site. All activities will be noted "Task tags" or "extra hand tags" per OSHA 1910.333. Punctured and exposed wires, or frayed electrical cords or cables shall not be used.
	Pinch Points	Avoid placing hands close to moving machinery. Place handling device at appropriate. Do not wear gloves when near moving parts as gloves or clothing may become entangled in the moving parts.
	Use of Power Tools	All recommended controls to actions that apply to power equipment also apply to hand tools. Inspect power tools for wear and damage. Do not use equipment with damaged cords. Use GFCI on extension cords when working outside or in wet environments. Wear gloves when punctured. Worn safety glasses if something may fly into your eye.
	Slips Trips Falls	Clear work route, works limits and other ground hazards from the drilling location. Function good handwheels to keep the ground around the drilling site clear of obstructions. Equipment and other for proper hazards. Wear appropriate foot protection to prevent slip and trips. Use caution when walking on uneven and wet ground surfaces.
Equipment To Be Used	Inspection: Key elements	Training Requirements
<ul style="list-style-type: none"> • PPE • Hand tools 	<ul style="list-style-type: none"> • Pre-Start maintenance • Visual guide to use 	<ul style="list-style-type: none"> • Tailgate safety meeting • Site specific orientation • Hazard observation and communication

Table 3-1 Activity Based Analysis (Continued)

(2) INTEGRITY TESTING OF SYSTEMS ASSOCIATED PIPES		
Principal Steps	Potential Safety/UHRS Hazards	Recommended Controls
1. Purging and SST performed in defect leaks	Pipe release potential during testing	Excess hydrogen (H ₂) fire extinguisher is placed for easy access and absorbent rags are positioned near the testing equipment.
	Potential to over pressurize and cut loss during testing	Test environment is predetermined, test pressure is constant over, just based on fluid system type i.e. reaction vessel pressurized to elements that provided by
	Dispensing equipment has potential to leak fuel during pressurization due to testing (i.e. 100% of normal operation) pressure	Excess placement of H ₂ fire extinguisher and absorbent rags near the dispensing of
Equipment To Be Used	Inspection Requirements	Training Requirements
FLS 1 has test agent provided by Technology Inc. during testing at Site 14 South Westfield Field	Daily visual check for leaks and an operational check once pressurized for verification of proper operation	Technology Inc. training and certification required prior to usage. Company system are taken to verify understanding of the system for proper usage.

Table 3-1 A clearly Hazard Analysis (Continued)

OSHA, LOCATE, AND HAZARD IDENTITIES		
Principal Steps	Potential Safety Hazards	Recommended Controls
1. Park, unhook, or disconnect vehicle drive.	Vehicle could fall backward or forward. Lever or clutch could be a broken handle.	Use spotters when positioning vehicle if needed. Ensure that spotters know how to communicate with the use of vehicle.
2. Unhook equipment from vehicle.	Lifting of equipment from vehicle could cause stress to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, leaning to sitting, and getting help when moving heavy-duty materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
3. Move equipment to designated storage location.	Handling of equipment could cause stress to worker. Slip, trip, and fall hazards could be present.	Carry equipment as required by the manufacturer of the equipment. Use steps when possible, and adjust for comfort. Use two or two walking so that there are no sudden stops or one-steps. Workers cause the worker to stress to maintain control of the equipment. Get assistance from a third worker if several equipments must be moved. For loads greater than 50 pounds use two people to carry. Visually inspect work areas and make, hazardous or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support workplace safety. Dismantle 18 inches or more diameter must be secured and marked. All equipment less than 18 inches in diameter and all holes must be marked or eliminated.
4. Survey and mark vehicles.	Worker could be struck by vehicle. Use of spray paint to mark underground vehicles and structures could expose employees to paint fumes or paint dust. Marking vehicles could create unknown hazards. When carrying stakes workers could trip and injure body. Installation of wood or stakes presents puncture and splinter hazards.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Pass or clearance as needed. When necessary to mark performance (a surveyor is often trapped on the back and may not be aware of safety but is). Use traffic controls or barricades if necessary to keep traffic away from workers. Follow manufacturer's instructions on use of paint. Review Material Safety Data Sheets (MSDS's). Never paint/try paint customer state the pattern. Use following universal color codes for vehicles: Blue = Water Pail, Electrical, T-Box, Gas, Open, Heavy. Carry stakes in back or carry bag under pant-leg, and carry bag in side of body. Stakes that all types are pointed to ward ground at all times. Keep stakes by pointed at ground. Wear leather gloves. Use caution when using tools to point stake in.
Equipment To Be Used	Key safety Requirements	Training Requirements
<ul style="list-style-type: none"> Hand tools 	<ul style="list-style-type: none"> Proff and maintenance Visual proof of use 	<ul style="list-style-type: none"> Tridgate safety meeting Safety signs identification Hazard elimination and recognition

Table 3-1 Activity Based Analysis (Continued)

4d. INTERFERING WITH INSTALLATION		
Principal Steps	Potential Safety Hazards	Recommended Controls
1. Push contractor vehicle carrying drill rig and equipment	Vehicle could hit someone or something	Use spotter when positioning vehicle if needed. Ensure that operator knows how to communicate with the use of vehicle
	Vehicle could create a traffic hazard	Locate vehicle in an area that is off established traffic
2. Unload equipment and materials	Load would have shifted during transport or be greatly lost down, causing load to be unstable	If load has shifted or too down are poorly secured, do not stand near truck or load. If necessary, move truck to a safe location, and position heavy equipment on safe where too down is being removed to prevent load from falling on that side.
	Lifting equipment and materials from vehicle could cause strain to worker	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help to lift heavy bulky items or materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Cuts and abrasions could occur while moving equipment and materials	Use caution when moving objects with sharp contact points
	Slip, trip and fall hazards could be present	Visually inspect work areas and mark, barricade or adequately flag and fall hazards. Only work on walkways or along curbs that have the strength and integrity to support equipment safely. Opening 10 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked as hazardous.
3. Transport drill rig and supporting area	In proper inspection of rig and supporting area could result in an unstable drilling environment and could cause workers to be exposed to hazards associated with operation mechanical devices	Ensure that rig and all associated equipment are inspected by a competent person and that rig is in safe operating condition, in accord with OSHA 1926.11. Transport equipment, including hoists, two person cables and hydraulic and pneumatic hoses, before use and at end of each shift. Tag and remove from service faulty or unsafe equipment. Verify that emergency shutdown system is clearly marked and location is known by all site workers. Verify that the emergency shutdown system is clearly marked and consists of a maximum of two kill switches one for the derrick and one for the hoist chucker. Ensure that the kill switch shows how to the action when the switch is pushed or pulled. Prior to drilling, perform site clearing and leveling to accommodate the drill rig and supplies and provide a safe working area. Drilling shall not be commenced when two basic unstable ground conditions occur: unsafe soil handling conditions. Operator's manual must be available and review prior to operations.
	On properly stored materials or	Ensure that requirements of OSHA 1926.11. Section 1926 are being followed to ensure that all workers are working properly. Until exposure to erosion during setup and workers will not engage in working during clearing process or any time. Stable storage location should be provided for all tools

Table 3-1 Activity Hazard Analysis (Continued)

(d) MISCELLANEOUS WELL INSTALLATION		
Principal Steps	Potential Safety Hazards	Recommended Controls
	Supplies	<p>materials and supplies on flatbeds, materials and supplies can be uncontrollably and safely handled without lifting or falling as a number of the drill crew as a worker avoid driving or transporting loads, materials or supplies without using the correct function of the drill rig. Pipe, drill rods, casing, augers and stand-offing tools should be properly stacked or made available to prevent spreading, rolling, or sliding. Transportation of other heavy materials should be placed at a safe location on the ground, or be secured to prevent movement when not in use. Work areas, platforms, walkways, scaffolding and other access ways should be kept free of materials, debris and obstructions and vehicles should be used. Please avoid that could cause a surface to become slick or otherwise hazardous. Controls, control linkages, warning and operation lights and horns should be stored out of oil, grease and dirt. Controls should not be stored in any position in a manner other than a nonengaging, not "catcher" with these controls while full speed and leaving the word "engaged" easily visible.</p>
6. Hand auger level 3 feet of rock having and place into bag per 2 feet increments	Hand augering, digging or post-holing could cause injury to lower back.	<p>Hand bones and use proper posture and back support while hand-augering, digging or post-holing boring holes. If hand augering, hand bones and use two people if necessary to remove capstone hole. If post-holing, ensure that area is clear before starting ground with pilot used to break up ground under it.</p>
	Hand augering, digging or post-holing over long periods of time could cause muscle strain.	<p>Monitor closely pain and follow work periods given on job. Select a posture during hand augering to maximize following elements: choose correct construction or steady flow, surface or surface position, repetitive hand motions, or excessive gripping, pushing or pulling.</p>
	Slip, trip and fall hazards could be present due to loose debris	<p>Protect all open excavations or any open exposures of soil, unexcavated soil that is present, all work sites should be fully labeled and off-limits.</p>
	Working could be struck by vehicles	<p>Wear high-visibility reflective vests at all times at work sites. Make eye contact with operators of vehicles. Materials and work drilling sites for visibility. If necessary, post use traffic controls in accordance with the Traffic Control Plan.</p>
	Use of hand tools	<p>Inspect all tools for damage before use. Do not use damaged tools, cracked and leg control surface. Monitor closely pain and follow work periods given on job. Select hand tools to maximize following elements: choose correct construction or steady flow, surface or surface position, repetitive hand motions, or excessive gripping, pushing or pulling work hands and legs on. Wear safety glasses with side shields and ensure all others around you to wear safety glasses or face mask. Wear safety glasses with side shields and ensure all others around you to wear safety glasses or face mask.</p>

Table 3-1 Activity Hazard Analysis (Continued)

(4) SUBSTANCES & ALL INSTALLATION		
Principal Steps	Potential Safety Hazards	Recommended Controls
		<p>using a chain. Keep all tools chained and securely stored when not in use. Use wrenches as only hand-on place means. Use screw drivers with blades that fit the screw slot. When using a wrench as a prybar, use some penetrating oil, use the largest notch available that fits the nut, and when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands while both feet are firmly placed. Do not pull or pull with one or both feet in the drill rig or the end of a steel pit or near other blocking-off devices. Always assume that you may lose your footing—check the place where you are (fall) for sharp objects. Keep all pipe wrenches chained in good repair. The jaws of pipe wrenches should be well lubricated frequently to prevent an accumulation of rusted grease that would otherwise build up and cause wrenches to slip. Never use pipe wrenches in place of a nut-busting device. Replace heads and handles when they become badly worn. Position your hands so that your fingertips do not become wedged between the wrench handle and the ground, as the platform when breaking tool jams on the ground on the drilling platform. The wrench, usually, or the post may splinter or split.</p>
	Worker could be exposed to chemical contaminants	<p>Avoid spills. Remove hazardous cleaning supplies on available. Wear required PPE and respiratory protection as specified in the SDS. Tissue respirators and cartridges are not being used determine selection of PPE and respiratory protection. Fix any PPE properly and wash hands.</p>
3. Position and set up drill rig and associated equipment.	<p>Failure to secure site properly has could cause exposure to potential hazards such as electrocution, damage to underground utilities, tripping or even an unstable rock formation.</p>	<p>Do not move drill rig into any work area until a site layout plan has been completed and made of level to ensure site has been assessed for hazards (overhead lines and stability of walls and ground). At the proximity safety briefing discuss the site layout plan and analysis of made of level along with ASHRAE Review that the drill rig is equipped with an operational emergency shut-down mechanism. Do not place rig within 10' back of any overhead electrical lines. When back-securing location, ensure that back support area is capable to outside diameter of rig or end of tool case being if applicable. Use a system for positioning an emergency failure during a drill rig walk, the mode of level reporting for day requires storage, yellow zone and avoid obstacles. Always check the bottom of a drill rig corner before heading, particularly on rough, uneven, or hilly ground. Check the complete drive train of accurate head-to-body for loose or damaged bolts, nuts, chain, shafts and mountings. Disconnect all passengers before moving a drill rig on rough or hilly terrain. Engage the front axle (for 4 x 4 or 6 x 6 rigs, vehicles or demand when traveling off highway or hilly terrain. Use caution on icy/slippery</p>
	Off road movement	

Table 3-1 Activity Hazard Analysis (Continued)

3d. INTERFERENCE WITH INSTALLATION		
Principal Steps	Potential Safety Hazards	Environmental Controls
		<p>inadequately. Conservatively evaluate safe-fill capability of fillings. Increase the safety of filled drilling tools away from the center of mass. When possible, travel directly up/dn or forward. Increase the pressure before starting to fully hammer, do not hammer until too pressure. Do not attempt to cross obstacles such as small logs and small water channels or ditches at an angle. Use the combination of pressure on the ground as a guide when lateral or overhead clearance is close. After the drill has been moved to a new drilling site, set all breaks and/or locks. When pushing or dragging, block the wheels. Never leave off road with the mast/derrick of the drilling or the mast in partially raised position.</p>
	Vehicle could move if not properly set up	<p>Extend stabilizer pads and secure footing as usual. Use a sign that is properly positioned on the place where a stabilizer pads. Do place wheels or stabilizer pads over machinery, rough low hills, etc. If a broken and place wheel, check under beam wheels of mobile rig. Ensure that the vehicle is level on both the vertical and horizontal planes.</p>
	Rig would contact overhead lines or structures when the mast moved or if the rig is transported with the mast raised	<p>Overhead signs will be visually located prior to moving the mast and a sign will be used while the mast is being raised. Never moving when mast is extended.</p>
	Wheels could become pinned between any and other track components or another could be pinned under rig if rig is reversed from under track.	<p>When any part of rig or equipment is or within, stand far enough away from moving parts to avoid being pinned between moving parts. Do not work standing on track while rig is supported by lifting pads. If work must be done and/or rig or track, the full crew supervisor must contact the SRO to arrange a safe method for isolation of any mast to ensure that adequate blocking is installed.</p>
	Rig's wheels could destabilize rig. Horizontal act as a counter during a maneuver.	<p>Check whether conditions and forecasts to determine if conditions are acceptable for use of rig. Do not operate rig if winds exceed manufacturer's recommended maximum.</p>
	Worker could be exposed to noise	<p>Wear earplugs whenever drill rig is in operation, if necessary.</p>
	Worker could be exposed to pinch points	<p>Wear pinching hands close to moving machinery. Wear leather gloves, as appropriate. Do not use gloves when near moving parts or places, as clothing may become entangled in the moving parts.</p>
	Electrocution, explosion etc could occur and cause injury to individual and life.	<p>Off line and wireman-supply of all personnel, always go to positioning the tool. Locate and mark working and exposed utilities using overhead marking poles. Off line Underground Service - A technique (800-4-03 2444) provide to job. Support the use of drilling activity to eliminate obstructions. Contact power facility supervisor when working near utilities. Ensure that weight of rig is evenly distributed on ground and is not as heavy as to damage any underground lines that may be near the surface (e.g., shallow, buried, PVC lines).</p>

Table 3-1 Activity Hazard Analysis (Continued)

(d) SUPERSTRUCTURE PILL INSTALLATION		
Principal Steps	Potential Safety Hazards	Recommended Controls
4. Start-up up and perform drilling	Pressurized hydraulic lines could rupture, causing release of hot fluid under fluid. Hot fluid could splash or penetrate worker with exposure from a splash, and cause uncomfortable contamination.	Ensure that personnel are trained in use of drilling equipment. Inspect all hydraulic lines before placing in service. Any damaged lines or connections must be replaced before use. Immediately shut if any equipment or lines rupture. Ensure that hot oil is immediately available to hot-spot small workers. Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. Ensure that a spill control kit is available at the drilling location. If rupture occurs as quickly as possible, begin the layout to minimize the area over which the liquid spreads. Ensure that all personnel have been wearing chaps.
	Any lines or hydraulic lines under pressure could suddenly release, whip, and hit a worker, causing serious injury.	Do not disconnect air lines and connections until hose has been bled. Visually inspect all connections of any lines under pressure. Use safety clamps to be checked to correct such leaks or connections to eliminate connections. Insulate clamps will keep lines from whipping under sudden release of pressure. Tie back or attach lines, whenever possible, to secure length of hose that could whip around if there is sudden release of pressure.
	Workers could be exposed to chemical agents.	Wear a collection of PPE with sufficient exposure protection. Remove all MSDS. Decontaminate drilling equipment after use (to avoid contamination park when coming to the next drilling site). Avoid exposure to dust. Use dust control as necessary and possible. Store and label all tool outputs. Decontaminate PPE as contaminated (based on exposure to contaminants) and place in contaminated PPE in a separate, properly labeled container. Decontaminate PPE as approved by the Project Manager and ECHO.
	Electrocution	Under most circumstances, the operator and other personnel on the rear of the vehicle should remain under and not leave the vehicle. Do not move or touch any part, particularly a rotating part, of the vehicle or the drill rig. If circumstances exist that the drill rig should be moved from all personnel should jump clear and as far as possible from the drill. Do not step off, jump off, and do not lean onto the vehicle or any part of the drill when jumping clear. If you are on the ground, you should stay away from the vehicle and the drilling. Do not let others get near the vehicle and the drill rig, and seek assistance from local emergency personnel such as the police or a fire department.
	Injury as result of rotating equipment	The operator and tool handler should establish a system of responsibility for the areas of rotation a function required for super-drilling, such as connections and disconnecting super portions, and connecting and securing the super fork. The operator must ensure that the tool handler is well away from the rig or vehicle and that the super fork is secure and locked during rotation.

Table 3-1 Activity Hazard Analysis (Continued)

340. SUBMERGENCE WELL INSTALLATION		
Principal Steps	Potential Safety Hazards	Recommended Controls
		Never place hands or fingers under the bottom of an engine section when breaking the engine over the top of the engine section in the ground or other work surfaces such as the drill rig platform. Never allow feet to get under the engine section, then being hoisted. When rotating engine, store clear of the rotating engine and other rotating components of the drilling. Never reach behind or around a rotating engine for any reason whatever. Use a long handled shovel to move engine sections away from the engine. Remove any your hands or feet to move sections away from the cover. Do not remove nails from rotating engine. Drapers should be cleared only when the drill rig is in control and the engine is stopped from rotating. Remove facilities or elements to a ready available Emergency Shutoff location. Ensure that all Emergency Shutoff switches function properly. Install eye guard to avoid eye getting caught. Workers shall wear eye protection, including safety glasses.
	Workers could place hands into moving parts of rig or loose clothing could become entangled in moving machinery parts, either of which could injure worker.	Control all moving components and moving parts. Do not wear loose clothing or any jewelry. Ensure that operators visually check all workers and visually confirm that all workers are clear of dangerous parts of equipment before starting or resuming movement.
	Workers could be exposed to noise.	When coupling, always wear full rig as equipment, if necessary.
	Workers could be exposed to pinch points.	Avoid placing hands close to moving machinery. When placing, as appropriate, keep consistently alert.
	Lifting of hoists could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, leaning, twisting, and getting help when moving hoist/hoists or materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
7. Move hoist to coupling location	Hoists could make contact with someone or something while being moved and are prone to slip.	When placing, as appropriate, be aware of people or objects that may be nearby or in proximity within length of hoist.
	Lifting of materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, leaning, twisting, and getting help when moving hoist/hoists or materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
8. Move panel.	Workers could come into contact with panel.	Avoid spills. When disengaged PPE. Remove PPE properly and wash hands. Avoid pinching but before MEES for panel. If high or other contact, wear full machine when handling dry panel.
	Lifting of materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, leaning, twisting, and getting help when moving hoist/hoists or materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
9. Four-panel into hoistable to seal	Workers could come into contact.	Avoid spills. When disengaged PPE. Remove PPE

Table 3-1 Activity Hazard Analysis (Continued)

(4) INTERFERING WITH INSTALLATION		
Principal Steps	Potential Safety Hazards	Recommended Controls
	<p>with great</p> <p>Control could cause jobsite to be slippery</p>	<p>properly and wash hands</p> <p>Wear gloves as appropriate. Use extra caution while removing nails and handling them, as they can prove to slip.</p>
15: Finish laying of rafters with concrete or asphalt, as necessary	Worker could become entangled with concrete on asphalt.	Avoid spills. Wear designated PPE. Remove PPE properly and wash hands.
Equipment To Be Used	Lifting/Other Requirements	Training Requirements
Digging up hard tools and power tools	Only on before use. Use inspection checklist. Complete forms and signs. A drill log (optional) must be available at jobsite.	<ul style="list-style-type: none"> Only trained equipment operators may operate heavy equipment, only Department of Motor Vehicle's licensed personnel will operate trailer. All drillers and drillers helpers must have documented training in use of eq.

Table 3-1 Activity Hazard Analysis (Continued)

C2. WELD DEVELOPMENT		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
1. Purge weld	Welder could be exposed to chemical contaminants.	Wear required PPE. The extent of PPE is to protect contact with pneumoblower that may have low levels of contaminants. Although if these contaminants are low in concentration, they still can be absorbed by skin or cause irritation to skin. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Decontamination stations of sample containers. Aural signal. Shower and cleaning supplies are available.
Equipment To Be Used	Logistics Requirements	Training Requirements
<ul style="list-style-type: none"> PPE Hard tools 	<ul style="list-style-type: none"> Pre-PPE maintenance Visual inspection 	<ul style="list-style-type: none"> Tailgate Safety Meeting Site specific orientation Hazardous waste operations Hazard Observation and Communication LOTO

D6. EQUIPMENT DECONTAMINATION		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
1. Decontaminate all available materials and equipment.	<p>Lifting of equipment and materials could cause strain to worker.</p> <p>Worker could be exposed to chemical contaminants.</p> <p>Decontamination area may become slippery.</p>	<p>Use proper lifting techniques such as keeping the back straight, lifting with legs (bending knees) and putting help when moving bulky/heavy materials and equipment. Use hand truck if needed. Personnel provide their 90 pounds capacity people to lift.</p> <p>Aural signal. Shower and cleaning supplies are available. Wear required PPE and respiratory protection as specified in the SDS. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Remove PPE properly and wash hands.</p> <p>Visually inspect work area and mark, barricade to eliminate slip, trip and fall hazards as feasible. Mark area proper dimensions on all work areas if decontaminating in plastic sheeting. Use caution on a plastic sheeting is extremely slippery. Wear footwear safe to have bump area dry and clean.</p>
Equipment To Be Used	Logistics Requirements	Training Requirements
<ul style="list-style-type: none"> PPE Hard tools 	<ul style="list-style-type: none"> Pre-PPE maintenance Visual inspection 	<ul style="list-style-type: none"> Tailgate safety meeting Site specific orientation Hazardous waste operations Hazard Observation and Communication LOTO

Table 3-1 Activity Hazard Analysis (Continued)

O* NET REVIEWAL AND REFINING		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
1 Place gear inside tote containers (e.g., 33-gallon drums, roll-off box, etc.)	Lifting of tote onto cart/dumpsters to transfer	Use proper lifting techniques such as keeping the back straight, lifting with legs, bending to knees, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. Use loads greater than 50 pounds on two people to lift.
	Worker could be exposed to chemical contaminants	Wear required PPE. Visual inspection and continuous monitoring will determine selection of PPE and respiratory protection. Environmental exposure of toxic air pollutants will be kept at or below the maximum allowed levels. Respiratory cleaning supplies are available.
2 Load drums onto vehicles	Handling of drums can expose worker to injury (including but not limited to chest, lacerations, and pinch points)	Drums must be individually properly labeled and then labeled as multiple drums are placed on truck. Use truck chocks. "Heavy Lift" and "over 1 ton away from dolly onto lift." Know that drums are secure and will be stable when lifted and moved. Place drum in appropriate location on truck for transport. Be sure to evenly distribute load weight on bed of truck. Secure drums in place on the truck. If drums are loaded with drum handling devices attached to backhoe or excavator, stand away from truck when drums are placed onto truck. Once drum is placed and "loader" moves away from truck, use drum dolly on truck to position drum. Avoid placing pallets of drums on truck unless pallet can be positioned where they will secure for transport. (It is very difficult to move loaded pallets manually.)
	Worker could be struck by vehicle	Wear high-visibility reflective vests at all times on work areas. Make eye contact with operator of vehicles. Position observer as needed when loading drums close to busy streets. Use traffic controls or barricades if necessary to keep traffic away from work area.
3 Transport drums to temporary storage location	Drums may leak.	Inspect all drums prior to and following transport. Have spill cleanup supplies and spill containment available. Leaking may become slippery. Wear work boots with good traction when drums are being moved. Wear eye protection PPE. Clean up all spills immediately. Notify supervisor.
	Handling of drums can expose to injury (including but not limited to chest, lacerations, and pinch points)	If handling drums use drum dolly/pallet forklift or drum pusher attached to backhoe or excavator to move drums into storage. If handling drums, inspect/push that drums must be moved over known that there are no pits or other obstacles that can cause drum to tip over or be difficult to handle over surface being traversed. Place drums in approved storage area. When outside handling drums avoid passing hands between drums and pushing fingers. Wear leather work gloves. If drums have to be manually positioned, know how to "back and roll" drums. Avoid manually positioning drums if at all possible. Only one person should "back and roll" drums if necessary to manually move drum without mechanical assistance.
	Slip, trip and fall hazards could be present.	Maintain good housekeeping and proper illumination in storage area.
4 Store drums in temporary storage	Drums may leak	Inspect all containers on a regular basis weekly for non-leaking on materials daily for hazardous materials. Have

Table 3-1 Activity Hazard Analysis (Continued)

OPI SITE RISK OF FALL AND OVEREXHAUSTION		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Focus on grading characteristics.		spill cleanup supplies and apron immediately available to workers may become slippery. Wear work boots with good traction when Aerial exposure is involved. When apron required PPE. Clean up all spills immediately. Strictly experienced
5 Remove cover of containers for sampling	Lifting from bins may cause spine particularly to happen and hands Worker could experience strain from use of tools Containers could rupture, shrapnel hazards, fire exposing workers to report	Identify and avoid pinch points, maintain proper body posture between bins and from. When ladder work, gloves when necessary and replacing from bins Inspect all tools for damage before use. Do not use damaged tools. Wash and tag "out of service." Select hand tools to maximize following elements: choose handle length that is steady force, resistance is reduced, lightweight from position, repetitive, forced motions, or excessive gripping, pushing or pulling with hands and forearms. Before fully lifting containers, cover, place probe through small opening and measure air inside using a PID or PFD. If reading is less than 10 ppm, open cover and proceed with sampling. If reading is greater than 10 ppm, workers come slowly and start hand to allow air to vent to outside. Monitor around a space after 5 minutes, and if readings are still above 10 ppm, contact 911-911.
6 Collect sample waste	Worker could be exposed to chemical contamination	When required PPE. Visual inspection and confirmation monitoring will determine selection of PPE and respiratory protection. Determine status of sample containers. Aerial spill. Excess spill, cleanup supplies are available
7 Replace or reuse cover	Replacing from bins may cause spine particularly to happen and hands Worker could experience strain from use of tools	Use care when replacing from bins. When ladder work Inspect all tools for damage before use. Do not use damaged tools. Wash and tag "out of service." Select hand tools to maximize the following elements: choose handle construction to steady force, resistance is reduced, lightweight from position, repetitive, forced motions, or excessive gripping, pushing or pulling with hands and forearms.
8 Pack samples for shipment	Manually moving materials and equipment could cause strain Containers of sample containers could leak, causing exposure to worker and possibly people handling shipping bin	Use proper lifting techniques such as keeping the back straight, lifting with legs, bending knees, and getting help when moving bulky/heavy materials and equipment. Use hand truck when hand long more than one bin at a time. Try to pack shipping boxes at that hand bin does not exceed 50 pounds. For loads greater than 50 pounds, use two people to core. Ensure that each container top is properly tightened. Tight each container to ensure to prevent damage to container during handling of shipping bin and during transportation. Ensure boxes meet required packaging standards based on mode of transportation, then for shipping bin.
9 Disassemble all available materials and spray wash	Lifting of equipment and materials could cause strain to worker	Use proper lifting techniques such as keeping back straight, lifting with legs, bending knees, and getting help when moving bulky/heavy items. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.

Table 3-1 Activity Hazard Analysis (Continued)

OY STEE RISE CYCL AND DISPERAL		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Worker could be exposed to electrical contamination	Avoid spills. Remove lost spill cleanup supplies as available. Wear approved PPE and engineering protection as specified in the OSHA Visual Inspection and Ambient Air Monitoring and Airborne Selection of PPE and Respiratory Protection. Remove PPE properly and wash hands.
	Overexertion when area may become slippery	Visually inspect work area and make sure safe to re-entrance. Try and fall hazards on location. Monitor proper placement in all work areas. If necessary, use plastic sheeting, use or clean, make plastic sheeting as necessary, slippery. Wear boots with good traction.
10. Load containers for transport.	Handling of containers can expose worker to injury (including but not limited to strains, lacerations and pinch points)	Remove doors are individually properly labeled (see labels on appropriate based on analysis, controls) and that labels are visible when doors are placed on track. One track that has "Turner-Left" and move door away from dolly carts left. Remove doors in areas and will not call a horn if you cannot. If load door to appropriate location on track for transport. Be sure to evenly doors with load weight on both of track. Remove doors in place on the track. If doors are loaded with door handling device attached to the door as an device, stand away from track when door is placed on track. Once door is placed and "loader" moves away from track, use dolly on track to position door. Avoid placing pallets of containers track unless pallets can be positioned where they will secure for transport. (This may difficult to move loaded pallets manually)
	Worker could be struck by vehicle	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Position observer as needed when loading doors close to busy streets. Use traffic vests or barricades if necessary to keep traffic away from workers.
	Containers may leak.	Inspect all containers prior to transport. Have spill cleanup supplies and equipment readily available. Emergency may become slippery. Wear work boots with good traction when avoid exposure to spilled. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.
Equipment To Be Used	Inspection Requirements	Training Requirements
<ul style="list-style-type: none"> PPE Hand tools 	<ul style="list-style-type: none"> Perform maintenance Visually inspect use 	<ul style="list-style-type: none"> Transportation Working Site specific orientation Maximum weight operations Manual observation and communication HAZOP

Table 3-1 Activity Hazard Analysis (Continued)

(B) MONITORING WILL LOCATION SURVEY		
Principal Steps	Potential Safety/Health Hazards	Recommended Controls
1. Park computer vehicle drive.	Vehicle could hit person or something. Location could create a traffic hazard.	Use spotter when positioning vehicle if load is known that spotter knows how to communicate with driver of vehicle. Locate vehicles in area that will not obstruct traffic.
2. Tallyed equipment from vehicle.	Lifting of equipment from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, keeping feeting and getting help when moving bulky/heavy materials and equipment like hard track of material. For loads greater than 35 pounds, use two people to lift.
3. Move equipment to designated survey location.	Handling of equipment could cause strain to worker. Slip, trip and fall hazards could be present.	Carry equipment as required by the manufacturer of the equipment. Use steps when provided and adjust for comfort. Use care when walking so that there are no wet, icy, oil or slippery that can cause the worker to strain or suffer an injury of the equipment. Get assistance from other workers if several equipments must be moved. For loads greater than 35 pounds, use two people to carry. Visually inspect work area and make, hazardous conditions such as trip and fall hazards. Only work on walking working surfaces that have the strong th and safety to support employees safely (spacing 18 inches or more in diameter must be spaced and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded.
4. Survey each point.	Worker could be struck by vehicle.	When high-velocity vehicles such as trucks or work areas. Make eye contact with operators of vehicles. Post an observer as needed when surveyor is using equipment to survey or when located on the left and may not be aware of nearby traffic. Use traffic controls or barricades if necessary to keep traffic away from workers.
Equipment To Be Used	Required Equipment	Training Required
<ul style="list-style-type: none"> • PPE • Hand tools 	<ul style="list-style-type: none"> • Fall/Post equipment • Visual cues to use 	<ul style="list-style-type: none"> • Tallying Safety Marking • Signposting equipment • Hazard observation and control methods

Table 3-1 Activity Hazard Analysis (Continued)

ON-GROUND WATER SAMPLING		
Principal Steps	Potential Safety Hazards	Recommended Controls
1 Push vehicle at well	Vehicle could become airborne or overturning	Use eye flash when pushing vehicle if needed. Warn flagpersons how close to communicate with driver of vehicle.
	Lifting could create a traffic hazard	Leave vehicle in an area that will not obstruct traffic.
2 Unload equipment and materials from vehicle	Lifting of equipment and materials from vehicle could cause strain to worker	Use proper lifting techniques such as keeping the back straight, lifting with legs, keeping feeting, and getting help when carrying bulky/heavy materials and equipment. For loads greater than 30 pounds, use two people to lift. Use mechanical lifting equipment (hand carts, trucks) to move large, heavy or awkward loads.
3 Move equipment and materials to designated sampling well location	Handling of equipment could cause strain to worker	Use care when walking so that there are no oil, gas, fluid or wet steps that can cause the worker to strain to maintain control of the equipment. Get assistance from other workers if needed. For loads greater than 30 pounds, use two people to carry.
	Slipping and fall hazards could be present	Warn area of housekeeping in work area. Mark or remove all unattended trip, slip, and fall hazards from sampling area. Mark any irregularities in the work area.
	Worker could be struck by backfill	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operator of vehicle. Post an observer, as needed, when well is close to busy streets. Use traffic cones or barriers if necessary to keep traffic away from workers.
4 Drive to well with cover and well cap	Lifting of well vault cover could cause back strain	Use proper lifting techniques such as keeping the back straight, lifting with legs, keeping feeting, and getting help if cover is too heavy or it is too difficult to handle because cover is damaged or warped. If cover is on heavy screen that cover is secured in specific position by latching or tie-off to prevent cover from falling on worker while in place on well vault.
	Worker could experience strain from use of tools	Inspect all tools for damage before use. Do not use damaged tools (saws, and tag "out of service"). Select hand tools to maximize following clearance: clearance muscle-mechanics or steady plane, extension or awkward configurations positions, repetitive flexion/extension, or excessive gripping/pulling or pressing with hands and fingers.
	Worker could get hand caught between cover and base when lifting cover	Use caution when lifting well vault cover. Wear leather gloves when handling covers.
	Well covers and openings to ground and well area may have cracks, such as block walls, broken masonry and block openings	Wear leather gloves when opening well cover. Inspect opening as much for cracks. If cracks are present, avoid them or repair them while wearing gloves. Have first-aid kit available in test area at all times. If cracks to any extent, then notify EHS. If possible, a person not allowed to insert if this should open cover.
	Well vault could have atmospheric hazards if well has not purged and the well space has not cleared. Gas	If well has historically contained high vapor concentrations before lifting cover to work, place gas detector at well opening in or around cover and monitor air inside using PID or PFD. If reading is less than 10 ppm,

Table 3-1 Activity Hazard Analysis (Continued)

ON-GROUND WATER SAMPLING		
Principal Steps	Potential Safety Hazards	Recommended Controls
	exposure to other to injury	1) go well cover and proceed with work activities. If needed at greater than 10 ppm, 2) go well cover directly cover cover and stand back to allow mud to settle. Waiter at stand back after 5 minutes and if readings are still above 10 ppm, protect the STESS.
3 Measure depth to groundwater	Waiter could be exposed to chemical contaminants	Wear required PPE. The intent of PPE is to prevent contact with groundwater that may have low levels of contaminants. Although these contaminants are low in concentration, they still can be absorbed by skin or cause irritation to skin.
4 Set up sampling equipment	Polypethylene shooting can be slippery Waiter could be exposed to pinch points	Wear boots will be 4-in. Use caution when maneuvering in or on polypethylene shooting especially if shooting is wet. Use care when setting up equipment. Wear leather gloves if necessary.
7 Pump well	Waiter could be exposed to chemical contaminants	Wear required PPE. The intent of PPE is to prevent contact with groundwater that may have low levels of contaminants. Although these contaminants are low in concentration, they still can be absorbed by skin or cause irritation to skin. Visual inspection and continuous monitoring will determine selection of PPE and respiratory protection. Decontaminate surfaces of body in decontamination spill. Decontamination supplies may not be available.
8 Collect groundwater sample	Collecting samples over long periods of time could cause muscle strain. Waiter could be exposed to chemical contaminants	Position body properly and follow mud ponds given on job. Select a position during sampling to maximize following chemical changes in mud ponds. Do not work in mud ponds or on lateral position. Repetitive forced motions or excessive pressure, motion, or pressure. Remove hand and protection of site contaminants with gloves before operation begins. Wear required PPE. The intent of PPE is to prevent contact with groundwater that may have low levels of contaminants. Although these contaminants are low in concentration, they still can be absorbed by skin or cause irritation to skin. Visual inspection and continuous monitoring will determine selection of PPE and respiratory protection. Decontaminate surfaces of sample containers. Avoid spills. Remove last spill cleaning supplies are available.
9 Replace well cap and well vent cover	Waiter could experience stress from use of tools. Waiter could get hand caught between mud cover and hole in low hanging cover	Inspect all tools for damage before use. Do not use damaged tools (nails and lag "out of service"). Select hand tools to maximize following stresses. Remove mud structures or clean them. Remove or avoid awkward hand structures position. Repetitive forced motions or excessive pushing, pulling or pressing with hands and fingers. Use care when replacing well mud cover. Wear leather gloves for handling cover.
10 Decontaminate all reusable materials and	Lifting of equipment and materials could cause strain to a worker	Use proper lifting technique such as keeping the back straight, lifting with legs, keeping feeting, and getting help when carrying bulky/heavy materials and equipment.

Table 3-1 Activity Hazard Analysis (Continued)

ON-GROUND WATER SAMPLING		
Principal Steps	Potential Safety Hazards/Injuries	Recommendations/Controls
equipment		Use hard track if needed. For loads greater than 50 pounds, use two people to lift.
	Worker could be exposed to chemical contaminants	Avoid spills. Ensure battery/dumping supplies are available. Wear required PPE and respiratory protection as specified in the SDS. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Follow PPE properly and work habits.
	Overexertion may occur because slippery	Visually inspect work area and track, barrels, or slabs for slip, trip, and fall hazards as feasible. Maintain proper clearances in all work areas. If dewatering/slaking is a plaster slaking, use caution where plaster slaking is extremely slippery. Wear boots with good traction.
11. Pack samples for shipment.	Manually moving materials and equipment at close range	Use proper lifting techniques such as keeping the back straight, lifting with legs, keeping feeting, and getting help when necessary. Ship heavy materials and equipment. Use hard track when handling more than one box at a time. Try to pack shipping boxes up that much less than or around 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping bins and during transportation. Ensure that boxes meet required packaging standards based on mode of transportation used for shipping.
Equipment to be Used	Inspection Requirements	Training Requirements
<ul style="list-style-type: none"> PPE Hard to Is 	<ul style="list-style-type: none"> Foot/foot maintenance Visual gear to use 	<ul style="list-style-type: none"> Yelpin Safety Working Site specific maintenance Hazardous waste operations Hazard chemical use and communication LORIS

Table 3-1 Activity Hazard Analysis (Continued)

OIR DEMOLITION		
Principal Steps	Potential Safety/Health Hazards	Recommendation/Controls
1. Dismantling and Site Cleanup	Electricity Equipment	All equipment, wires, rods and tools will be properly secured during transport.
	Unstable Dred Fill	Never work the drilling rig with the mast upright. Use hydraulic leveling jacks before moving the mast.
	Lifting Up Equipment	Use a ground grade sling with a shockless hook-up chain during equipment lifting.
	Electrocution	Inspect for buried and overhead cables in the vicinity of the drilling location. A drilling clearance permit shall be obtained from local personnel or utility companies prior to installing extension equipment. All extension cords shall be rated "hard usage" or "extra hard usage" per OSHA 1910.331(c)(4) and shall not be used in wet, or forest electrical areas or cables shall not be cut.
	Tripping Hazards	Avoid placing loads close to moving machinery. Wear leather gloves as appropriate. Do not wear gloves when moving parts as gloves or clothing may become entangled in the moving part.
	Use of Power Tools	All recommended controls in section 3 that apply to power equipment also apply to hand tools. Inspect power tools for wear and damage. Do not use equipment with damaged tools. Use GFCI on extension cords when working outdoors or wet environments. Place gloves when per 1910.331. When safety glasses if something may fly into or on eye.
Equipment To Be Used	Slips/Trips/Falls	Clear logs, roots, stumps, limbs and other material from the drilling location. Per 1910.331 during moving to keep the ground around the drilling site clear of obstructions, equipment and other logging hazards. When appropriate fasten protection to protrusions and logs. Use caution when working on uneven and wet ground surfaces.
	Equipment Requirements	Training Requirements
<ul style="list-style-type: none"> • PPE • Hand tools 	<ul style="list-style-type: none"> • Certified maintenance • Visual particle test 	<ul style="list-style-type: none"> • Tailgate safety meeting • Site specific orientation • Hazard observations and communication.

3.2.1 Hazards Associated with H-Installation and Demolition: The main hazards associated with mobilization and demobilization of field personnel and equipment are flying particulates, objects striking the heads of field personnel, and several site hazards such as heat and biological hazards. Methods of mitigating these hazards are listed in Table 3-1.

3.2.3 Hazards Associated with IDW Bypass: The main hazards associated with IDW disposal include contact with contaminated wastewater, deepwater and sediments. Disposal of potentially contaminated soil from drilling and well installation activities will be completed as described in the Work Plan and Sampling and Analysis Plan (SAP). Drilling and disposal activities field personnel will wear proper Level D personal protection equipment (PPE). Any IDW and wastewater created under this effort will be disposed of offsite or at Moffett Field Wastewater Aquifer Treatment System (WATS) facility. A private subcontractor will be procured to remove all IDW from the basin and dispose of it properly with the exception of IDW wastewater that may be disposed of at the WATS facility. This subcontractor will be responsible for ensuring the safety of its employees and adherence to proper use of PPE during transport and disposal for IDW. All hazardous waste collected under this task order will be disposed of offsite in less than 60 days. The original waste manifest will be given to the RCRC office.

3.2.3 Hazards Associated with Well Drilling and Well Installation: The main hazards associated with well boring and groundwater monitoring well installation are listed in Table 3-1 and include flying particulates, objects striking the heads of field personnel, noise, contact with contaminated soil and groundwater, and vibration and contacted volatile constituents.

Drilling equipment will be operated, inspected, and maintained according to manufacturers' operating manuals. Moffett will subcontract the drilling and installation of all wells at Site 14 South, Moffett Field to Marine Drilling Associates (MDA). Moffett field personnel will be present during these activities to supervise and monitor the health and safety of field personnel.

Prior to the start of any drilling activities, a survey of the site will be completed. This survey will include all overhead hazards and any underground utilities or hazards. The survey results and maps will be used to determine any previously unknown hazards. This information will be discussed in the Pre-Drill/Tapline Meeting and will be used to determine the location of and design and monitoring wells.

3.2.4 Hazards Associated with Groundwater Sampling: The main hazards associated with groundwater sampling include direct contact with contaminated groundwater. Procedures for properly sampling groundwater that may be potentially be contaminated are described in the SAP. During groundwater sampling activities, field personnel will wear proper Level D PPE.

3.3 Hazards Associated with Petroleum Hydrocarbons

Casoline is classified by CERCLA as a flammable liquid, and diesel is classified by CERCLA as a combustible liquid. All are non-polar, flammable, and immiscible in water. Gasoline volatiles are highly flammable and vapors may form explosive mixtures with air. Inhalation or contact with this group of materials may cause irritation or burning of the skin and eyes. Vapors may cause dizziness or suffocation.

3.4 Hazards Associated with Volatile Organic Compounds

A list of the VOCs of concern and other compounds identified as being in the ground water on and near their associated exposure limits are presented in Table 3-2, which also lists the primary health hazards associated with each VOC. Below is a listing of these compounds which are likely associated with gasoline.

3.4.1 Benzene: Benzene (CAS 71-43-2) is a colorless, highly flammable liquid with an aromatic odor. This is composed of products derived from coal and petroleum. Benzene is found in gasoline and other fuels, and is used in the manufacture of plastics, detergents, pesticides, and other industrial chemicals. Benzene is a known human carcinogen. Lower levels exposure to high levels of benzene can cause leukemia, a cancer of the blood-forming system. Benzene can cause harmful effects on bone marrow and the immune system, increasing the chance for infection. It can also be absorbed through the skin and is incompatible with strong oxidizers. It can be a dangerous fire hazard. It has a lower explosive limit of 1.3 percent and an upper explosive limit of 7.1 percent. The ACGIH (2008) recommends a TLV for an 8-hour exposure of 0.5 parts per million (ppm) and a STEL of 2.0 ppm.

3.4.2 Ethylbenzene: Ethylbenzene (CAS 100-41-4) is a colorless, flammable liquid with an aromatic odor. This is composed as employed as a solvent and as an intermediate in the production of styrene. Ethylbenzene is also found in automotive or engine products. Ethylbenzene is incompatible with strong oxidizers and can be a dangerous fire hazard. It has a lower explosive limit of 1.0 percent and an upper explosive limit of 6.7 percent. The odor threshold for ethylbenzene in air and water is 0.025 ppm. The 2008 ACGIH recommended TLV for an 8-hour exposure is 100 ppm, and a STEL of 225 ppm.

3.4.3 Toluene: Toluene (CAS 108-88-3) is a colorless liquid with an aromatic odor is produced for commercial use in the process of making gasoline and other fuels from crude oil, in the making of color from coal, and as a hydrocarbon in the manufacture of styrene. Toluene is used in paints, paint thinners, and polish, lacquers, carbon disulfide, rubber and in some printing and leather tanning processes. Toluene is flammable by standard test as an oil and not soluble in water. The lower explosive limit is 1.3 percent and the upper limit is 7.1 percent. The 2008 ACGIH recommended TLV for an 8-hour exposure is 20 ppm.

3.4.4 Xylene: Xylene (CAS 1336-20-7 for mixed isomers) is a colorless liquid with aromatic odor. Commercial xylene is a mixture of the three isomers: ortho, meta, and para xylene. Xylene is a solvent and a constituent of paint, lacquers, varnishes, cleaning fluids, and engine fuel. Xylene is incompatible with strong oxidizers and can be a dangerous fire hazard. It has a lower explosive limit of 1.1 percent and an upper limit of 7 percent. The odor threshold for xylene in air is about 1 ppm. The odor threshold for meta xylene in air is 1.1 ppm and in water is 0.017 ppm. The 2008 ACGIH recommended TLV for an 8-hour exposure is 100 ppm, and a STEL of 250 ppm.

3.4.5 Methyl-tert Butyl Ether: Methyl-tert butyl ether (MTBE) (CAS 1096-04-5) is a clear colorless liquid with a slight kerosene-like odor and a mild acetone-like odor. MTBE is a petroleum additive that boosts the combustibility of fuel. Small amounts of MTBE are used to produce high purity octadecane. The 2008 ACGIH recommended TLV for an 8-hour exposure is 50 ppm.

3.5 Hazards Associated with Heavy Equipment

The hazards associated with the operation of heavy equipment can be effectively managed through adequate training and constant awareness. Constant visual or aural contact with the equipment operator will function in such scenarios. All mobile equipment operators will have had the required training and should demonstrate the necessary skills to operate heavy equipment. Mobile equipment will not obstruct pathways, or always be electrical lines. Proper distance from overhead power lines should be observed. All personnel working around heavy equipment will wear seat belts and safety seat belts.

36 Slip Trip Fall Hazards

Although it is difficult to prevent slip-trip-fall hazards, these hazards can be recognized through good housekeeping, proper site control measures, and keeping the work area free of obstructions.

Personnel will be required to perform fieldwork in pairs (buddy system) so that immediate assistance will be available should a slip-trip-fall occur. Slip-trip-fall hazards will be addressed through an ongoing proactive housekeeping program that eliminates elements in the work area that have the potential of causing substantial loss of footing.

Table 3-3 Primary Health Hazards and Exposure Limits for Chemical Substances at Moffett Field

Compound	PEL TWA ¹	PEL STEL ²	TLV TWA ³	TLV STEL	Primary Health Hazard
Gasoline	—	—	200 ppm	500 ppm	Irritates eyes and nose; causes nausea and dizziness; absorbs through skin.
Diesel	—	—	100 ppm ⁴	—	Irritates eyes and nose; causes nausea and dizziness; absorbs through skin.
Gasoline	1 ppm	10 ppm	0.5 ppm	2.5 ppm	Irritates eyes and nose; causes headache, nausea, and dizziness; neurotoxic. ⁵
Toluene	200 ppm	—	70 ppm	—	Irritates eyes and nose; causes nausea, affects liver and central nervous system.
Xylenes	100 ppm	125 ppm	100 ppm	150 ppm	Irritates eyes and is severe neurotoxic.
Xylenes	100 ppm	—	100 ppm	150 ppm	Irritates eyes and nose; causes nausea, affects liver and central nervous system.
BUTANE	—	—	70 ppm	—	Irritates nose, throat, skin, and eyes.

121 OSHA 29 CFR 1910.1000.2 table

122 TLV and STEL ACGIH 2000

PEL TWA = permissible exposure limit time-weighted average

PEL STEL = permissible exposure limit short-term exposure limit

TLV TWA = threshold limit value time-weighted average

3.7 Lifting Hazards

Field operations often require that physical labor tasks be performed. All employees should employ proper lifting procedures. Additionally, employees should not attempt to lift bulky or heavy objects (greater than 35 pounds) without assistance.

3.8 Tool and Equipment Hazards

Hazards present during the use of tools and equipment are generally associated with improper tool handling and inadequate maintenance. Management of these hazards requires a program

maintenance of tools and equipment and effective training of employees on the proper use of these tools. Electrically powered tools have inherent physical hazards. Handheld power tools should be held firmly. Proper safety procedures will be implemented during their operation.

Electrical tools should have minimum insulation and should never be exposed to water or other liquids. A ground fault circuit interrupter (GFCI) and/or coil cover can be used for any outdoor work and in any area where water may be present. Large power tools and equipment should be lifted properly to prevent back exposure.

Safety glasses, ear/eye shields, ear protection, and safety tool blocks will be worn while operating powered tools or equipment.

3.8 Heat Stress Hazards

The warm ambient temperature at Moffett Field during the late summer will increase the potential for heat stress. During hot or humid days, reducing the performance of strenuous work, some precautions will be necessary to reduce the potential for heat stress. Implementation of worker rotation and rest/paced schedules and adjustment of the workday to take advantage of the cooler parts of the day may be used to prevent exposure to heat stress hazards. Whenever possible, shade will be used or provided to field personnel to help mitigate heat stress hazards. Also, frequent consumption of water or an electrolytic beverage is necessary to prevent dehydration. This requirement that employees drink about 16 ounces prior to starting work, and 8 to 7 ounces every 15 to 20 minutes while working in a hot environment. Workers experiencing heat/cold stress will be evaluated prior to returning to work. For those persons experiencing heat stroke, returning to work should be delayed until declared fit by their company's physician.

The levels of heat stress are characterized in Table 3-2. Factors which increase the risk of heat related problems include the following:

- High physical exertion.
- Being accustomed to working in heat.
- Wearing protective clothing that traps body heat.
- Age/old or people may have lost body water and lower sweat gland efficiency.
- Being overweight, making the body work harder to perform tasks.
- Medication that can interfere with normal body reactions to heat.

3.8.1 General Site Safety

Hard hats, hearing protection, and PPE labeled above are required during drilling operations and at Moffett Field. Depending on anticipated total particulate hydrocarbon (TPH) or VOC concentrations, field personnel may be required to have an air purifying respirator available during soil boring and monitoring well installation activities. The following PPE and clothing will be used during field sampling activities (see also a detailed list in Section 5.1):

- Safety tool boxes
- Goggles or safety glasses with side shields
- Reflective traffic vests
- Leather gloves when ground points are a potential hazard
- Standard work clothing or chemical-resistant Tyvek® overalls
- Nitrile or equivalent (but not latex/natural rubber) gloves

3.8.1.1 Biological Hazards

Personnel may be exposed to several biological hazards while performing work at Moffett Field. These hazards may include primarily insect bites and stings (i.e., bees, wasps, hornets, snakes and black widow spiders).

Treatment will be provided for persons exposed. First aid procedures for biological exposure will follow the program set up by the American Red Cross.

Table 3-1. Signs and Symptoms of Heat-Related Illnesses and Treatments

Problem	Body Response	Signs and Symptoms	Treatment
Heat Cramps	<ul style="list-style-type: none"> The body loses too much salt from heavy exertion in heat. 	<ul style="list-style-type: none"> Painful spasms of muscles used during work. 	<ul style="list-style-type: none"> Get the person to a cooler place and have him or her rest in a comfortable position. Gently stretch the affected muscle and replace fluids. Give a half glass of cool water every 15 minutes. Do not give liquids with alcohol or caffeine.
Heat Exhaustion	<ul style="list-style-type: none"> The body can't replace fluids and/or salt lost in sweating. Dehydration in heat is important because it cools the body as it evaporates. 	<ul style="list-style-type: none"> Weakness, dizziness, nausea. Pale or flushed appearance. Sweating, rapid and clammy skin. 	<ul style="list-style-type: none"> Get the person out of the heat and into a cooler place. Remove or loosen tight clothing and apply cool, wet cloths. If the person is conscious, give cool water to drink. Make sure the person drinks slowly. Give a half glass of cool water every 15 minutes. Let the person rest in a comfortable position, and watch carefully for changes in his or her condition.
Heat Stroke	<ul style="list-style-type: none"> The body no longer sweats and holds its much heat. Body temperature reaches dangerous levels. Heat stroke is a medical EMERGENCY and can lead to delirium, coma, brain, or even serious eye or death. 	<ul style="list-style-type: none"> Body has red, inflamed skin, and RACE + F SWBATDNC¹ Body has patches of RACE + F as greater and clamy rapid pulse Delirium Coma 	<ul style="list-style-type: none"> Heat stroke is a life-threatening situation. Call 911 immediately or your local emergency number. Move the person to a cooler place and have him/her lie down. Remove or loosen tight clothing as emergency permits and apply cool, wet cloths. Watch for signs of breathing problems.

¹RACE = Emergency Medical Services

Section 4.0 SITE CONTROL

4.1 Work Area Control

Proximity to field activities will be limited to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors and the public.

Work area control will be achieved through the use of access/exclusion zones, contamination delineation and support area. All these areas will be established for field activities. The area immediately surrounding the drilling tower drilling will be designated the exclusion zone. During water-based slough trials (UST) piping integrity testing the area immediately surrounding USTs and the submersible piping will be designated the exclusion zone. The exclusion zone and contamination delineation zone will be designated with buffer zones and/or caution tape. The decontamination of drilling equipment using a portable decontamination trailer will be performed in the contamination delineation zone. The area outside of the contamination delineation zone will be considered the support area. The bucket list will be kept in the support area. Field personnel working in the exclusion zone will be required to sign in and sign out on a daily basis as they enter and leave, respectively.

During groundwater sampling activities, the mobile sampling trailer will be oriented to minimize its impact to surrounding vehicles, buildings and other operations. The area surrounding each monitoring well will be the exclusion zone. Because the groundwater sampling trailer is designed to be mobile, the decontamination area is located on the trailer. Therefore, the trailer and the area surrounding it will be considered the contamination delineation zone. Non-D officials personnel will be directed away from the immediate area of the trailer and wells using buffer zones and caution tape if required. Because the sampling trailer is not stationary, the three zones will shift depending on the area that are being sampled. The area outside of the contamination delineation zone will be considered the support area. The bucket list will be kept in the support area.

4.2 Decontamination Control

All nondeployable field equipment will be decontaminated before each use and between uses plus to avoid cross-contamination between samples and to ensure the health and safety of the field crew. The decontamination procedures for each project will be specified in the Sampling and Analysis Plan (SAP) for that project. Drilling equipment will be decontaminated by high-pressure washing. Decontamination of drilling equipment will be performed in a portable decontamination trailer. All other nondeployable sampling equipment and personal protective equipment (PPE) will be decontaminated by washing with a phosphate-free detergentsolution or by steam cleaning. All decontamination water will be collected in an approved poly-tank and will be disposed of off site prior to the required 60-day maximum holding time.

In general, the following decontamination procedure will be used for nondeployable sampling equipment and PPE:

- Rinse with potable water
- Wash with Lysol™ detergent and hot water and clean with a stiff bristle brush.
- Rinse three times with deionized (DI) water
- Rinse with isopropyl-alcohol
- Place the sampling equipment in a clean room and air-dry

Section 3.0 PERSONNEL PROTECTION

The possibility of exposure to petroleum hydrocarbons and volatile organic compounds (VOCs) presents a minimal potential health risk to site workers and personnel. Site assessment activities present a minimal opportunity to create circumstances of concern to high concentrations. The primary method of personal protective clothing will be the use of disposable article gloves, safety glasses with side shields, and safety shoe boots. If necessary based on the exposure levels listed in Table 3-2, respiratory protection, and engineering or work practice controls will be used to minimize exposure and to protect workers and Mottville Field personnel. The level of protection to be used throughout the duration of this task order will be U.S. Environmental Protection Agency (U.S. EPA) Level D, as based on known-contaminant levels and previous work performed at Mottville Field. Due to the impossibility of the field personnel to inspect all personal protection equipment (PPE) prior to use. Evaluation of the effectiveness of the Mottville PPE program will be assessed by the Site Health and Safety Officer (SHSO) following the guidelines established in the Mottville PPE Program Manual (Mottville, 2004a).

3.1 U.S. EPA Levels of Protection

There are five levels of U.S. EPA mandated personal protection, Levels A, B, C and D. Levels A, B, and C are not anticipated for this task order. If site conditions change and a higher degree of protection is required, the SHSO will consult the Health and Safety Officer/Consultant (Industrial Hygienist) (HSC/CHI) and the required changes in PPE will be made. A change in the level of PPE will result in the Site Health and Safety Plan (SHSP) being amended and approved by the HSC/CHI.

Level D protection will consist of the basic work clothing plus the following depending on activities to be performed:

- + Hard hat
- + Coveralls/standard work clothing
- + Safety glasses with protective side shields
- + Safety shoe boots
- + Mitts gloves (or equivalents)
- + Reflective Traffic vest
- + Leather gloves when pinch points are a potential hazard
- + Available hearing protection
- + Available protection against chemicals (PPE) (e.g., eye shield, boots or leg chaps)
- + For emergency purposes, as in the event of PPE upgrade, an available full face or full face air purifying respirator with National Institute for Occupational Safety and Health (NIOSH) approved combination organic vapor/acid gas/acid aerosol cartridges to use

(HSEPA) (enclaves) (enclaves) (enclaves) All personnel who may be required to wear a respirator will have their required respiratory detected before the beginning of the project.

5.2 Air Monitoring Procedures

Screening for the presence of VOCs while conducting field work is generally done with a handheld photoionization detector (PID) or flame ionization detector (FID). During drilling, breathing zone readings will be taken periodically (approximately every 10 minutes) unless the HSEPA determines that more frequent monitoring is required. Field personnel will perform a daily calibration of the FID/PID (at the beginning and end of each day) using as appropriate gas filled canisters (more than one) and gas of a pre-determined concentration) and operate the instrument according to the manufacturer's instructions. The air monitoring results will be compared to the action levels identified in Table 5-3. Depending on the concentrations encountered during air monitoring, the appropriate PPE will be selected. The daily air monitoring results and calibration information will be written on the Air Monitoring Data Sheet (Attachment 2) of the final HSEPA and will be available for all site workers to review. Air monitoring will accomplish the following tasks:

1. Ensuring that proper PPE work practices and engineering controls are being used at the site.
2. Ensuring that site personnel are not exposed to concentrations of hydrocarbon compounds exceeding the PELs and
3. Quantifying the concentrations of volatile hydrocarbon compounds at the wellhead and the workers' breathing zone.

Section 5.0 GENERAL SAFETY RULES

5.1 Recommended Equipment Safety Guidelines

Equipment maintenance and safety are the responsibility of the operator (see Attachment 3 for drilling safety guidelines). The following information is provided as general guidelines for safe site practices:

- Inspect the status of travel before moving equipment off road, make note of rocks, trees, water, and uneven surfaces.
- Approach changes in grade slowly to avoid shifting loads or unexpected steering/tilting.
- Use a spotter (person at grade) to provide guidance when vertical and lateral clearance is questionable.
- Look for overhead and buried utilities prior to normal operations. Test overhead electrical lines or if they were recognized.
- Contact the appropriate utility agencies to deactivate overhead or underground services that may interfere with sampling operations. Only authorized and trained personnel should attempt to handle utilities.
- Note wind speed and direction to prevent overhead utility lines from contacting equipment.
- Allow at least 10 ft clearance from overhead overhead utility lines.
- Contact appropriate utility agencies to survey, mark, and flag locations of buried utility lines.
- Maintain safety housekeeping of the groundwater sampling trailer.
- Store tools, materials, and supplies in a secured area.
- Maintain working surfaces free of obstructions or potentially hazardous substances.
- Store gasoline only in metal containers specifically designed for such use.

5.2 General Safety during Well and Groundwater Sampling

Personal and/or personal protective equipment (PPE) is appropriate during sampling activities. Communication equipment should be practical at all times. Personnel must employ the buddy system at all times and maintain communication with each other. In some situations, such as work in isolated locations, additional monitoring may be needed to establish the proper level of protection before the sampling team can proceed. No activities in enclosed or confined spaces will be permitted under this task order. Personnel responsible for handling groundwater and samples will wear disposable nitrile gloves and Level D PPE protection. Laboratory personnel will be alerted of the hazard type and potential contaminants present. Material Safety Data Sheet (MSDS) information for total

petroleum hydrocarbons (TPH) and volatile organic compound (VOC) constituents are provided in Attachment 4 of the Site Health and Safety Plan (SHSP).

6.2 Decontamination Safety

Decontamination procedures can pose hazards under certain circumstances, particularly when chemical decontamination solutions are used. Most of the equipment and assets will be decontaminated by washing or a series of washings, followed by a series of rinses using pure water amounts of deionized (DI) water (see Section 4.2). Exposure to hazardous materials and decontamination solutions will be controlled by the use of appropriate personal protection clothing and accessories, which includes safety glasses with side shields, nitrile gloves, and safety tool bags. MSDS information for methanol (methyl alcohol) and Equinox™ are provided in Attachment 4 of the SHSP. Decontamination of equipment by steam cleaning will be done by the drilling subcontractor away from ground personnel. Any averaging-time-derived waste (IDW) generated as a result of decontamination procedures will be characterized and then disposed of properly. For Midland Field requirements stored IDW will not be left on-site for more than 60 days.

Section 7.0: EMERGENCY ACTION PLAN

7.1 Communication

A communication program will be implemented during the project. Workers are to use the facility system of all forms and be cognizant of the selection of concise written notation in high-contrast areas. The specific hand signals to be used during the project will be discussed in the tailgate safety meeting and will include features referenced to the following:

- | | |
|-----------------------------|--|
| • Closed fist. | - Stop work. |
| • Hand extended above head. | - Personal injury. |
| • Hand cupping throat. | - Cannot talk, hearing difficulty remaining. |
| • Cup palms to wrist. | - Cannot talk, lower area, immediately. |
| • Hands on top of head. | - Head ache/pain. |
| • Thumbs up. | - OK. I am all right, I understand. |
| • Thumbs down. | - No response. |

7.2 Site Evacuation Procedures

In case of emergency, an air horn, or an equivalent device that can be heard in at least 90 dBA of noise will be used as the evacuation warning. One long blast from the horn will be understood to mean immediate evacuation from the work area. Personnel working on the site will immediately make their way to the designated gathering point from "blast point". The gathering point will be site and activity dependent and therefore will vary. The Site Health and Safety Officer (SHSO) will determine the gathering point and notify all site personnel at the daily tailgate meeting.

In the event that an emergency requires the evacuation from the site area, the former Mallard Field Main Gate Entrance will be the assembly area. A map and directions to the off base emergency medical facility from former Mallard Field is presented in Figure 7.1. The emergency evacuation route to the assembly area is provided in Figure 7.2. The emergency evacuation plan will be reviewed and discussed at the first pre-work tailgate meeting and as necessary when new personnel arrive on-site. In addition, copies of Figures 7.1 and 7.2 will be maintained in all vehicles at the site. Following field work/downtime hours, lessons learned pertaining to implementation of emergency procedures will be evaluated for future field projects during a debriefing meeting.

7.3 First Aid

A first aid kit and/or a first aid kit, containing the American Red Cross First Aid Manual and Site Health and Safety Plan (SHEP) with Medical Safety Data Sheets (MSDSs) will be obtained on each field vehicle. The following personnel are trained in first aid: on-call inventory maintenance (CPI) and blood issue pathogen:

- Robert Jansky (Ratelle) SHSO
- Ryan Wernick (Ratelle) alternate SHSO
- Richard Smith (KURAC) alternate SHSO

If an injured individual requires further attention, the individual will be immediately transported to the nearest hospital. A map illustrating the route to the off base emergency medical facility is presented in Figure 7.3. If necessary, the vehicle will be transported prior to transport to the facility if the injury is serious. A notification is of secondary importance. A copy of any applicable MSDSs

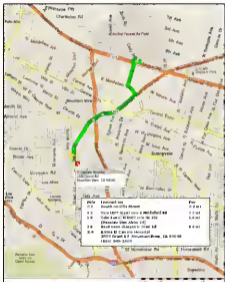


Figure 7-1. Hospital Routes to St. Camillus Hospital

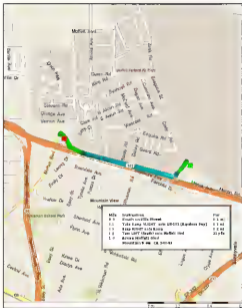


Figure 7-3. Map Showing Location of Reclamation Assembly Areas

will accompany injured workers to the medical facility. All accidents without injury to severity will be documented by the SHSO on the Accident/Incident Analysis Form (Attachment 3). The Accident/Incident Analysis Form will be forwarded to the Health and Safety Office (HSO) and Project Manager within 24 hours. An analysis of the accident will be conducted by the HSO/CHS following the guidelines in the *Ballistic Accident/Incident Reporting and Investigation Program Manual* (Ballistic 2020).

General first aid procedures are outlined below:

- **Skin Contact:** Use copious amounts of soap and water. Workpieces affected areas thoroughly then provide appropriate medical attention. A patch is applied to skin will be located in the contamination instructions area and/or support area as appropriate and eyes will be flushed upon chemical contact.
- **Inhalation:** Move to fresh air and, if necessary, decontaminate and transport to the hospital. Any loss of consciousness or response to airborne toxic substances, even if the individual appears to have fully recovered, will require immediate treatment by a medical professional.
- **Ingestion:** Notify the Poison Control Center and emergency medical facility and transport to nearest emergency medical facility immediately.
- **Penetration Wound or Laceration:** Decontaminate and transport to emergency medical facility. Apply direct compression to stop or slow the flow of blood.
- **Biohazard Hazard:** Identify the specific animal responsible for the injury (if possible); notify the nearest emergency medical facility and transport the affected worker there immediately.

7.4 Decontamination during Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, decontamination procedures may be limited or delayed and be performed at the emergency facility. If the contamination does not present a hazard to the rescue personnel, life-saving care may be initiated immediately. If contamination will present a risk to rescue personnel, manual decontamination should be performed to allow initiation of aid.

Medical assistance personnel will be notified prior to transporting the victim if the victim may be contaminated. Assistance must be made that the medical personnel at the receiving area are able and willing to handle a victim who is contaminated. However, because it is anticipated that only low level concentrations of gamma-emitting groundwater will be encountered at Site 14 South and the likelihood of any workers becoming in direct contact with the reported water is low, the site maintains the self-rescue procedure for medical assistance personnel. This personnel will accompany contaminated victims to the medical facility to advise them on matters involving decontamination. A copy of the SHSP including the MSDS will accompany the victim.

Heat-related illnesses range from heat fatigue to heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Loss of consciousness also requires prompt attention. Unless the victim is obviously contaminated, decontamination may be omitted or minimized and treatment begun immediately.

Only a qualified physician is allowed to treat inhalation exposure cases. If the contaminant has entered through the eyes, an American National Standards Institute (ANSI)-approved emergency portable eyewash station will be used to rinse the eyes(s) with water. Because only low concentrations of gasoline-vaporized metals are expected at the site, if dermal/dental contact occurs, the affected area will be cleaned on site.

7.5 Emergency Assistance

The name, telephone number, and location of police, fire, and other emergency response agencies will be posted in the neighborhood. If emergency personnel are called to the site, efforts will be made to accommodate their safety operations.

Emergency Services

NASA Police Services	911 (Mobile phones) (950) 624-3223 (radio) (950) 624-5617 (non-emergency)
Fire	911
Mountain View Fire Station #5 225 N. Wilcox Rd. Mountain View, CA 94040	non-emergency (950) 763-6333
Painis Control Center	(800) 876-4788
National Poison Control Center	(800) 222-1222
National Response Center: Toxic Chemicals and Oil Spills	(800) 426-6822

Medical Centers

El Camino Hospital 2500-Court Rd. Mountain View, CA	(950) 940-7000
UPS Healthcare 1135-E. Aspen Avenue Sunnyvale, CA	(408) 733-5000

Regulatory Agencies

U.S. Environmental Protection Agency	(800) 290-9100
California Emergency Response After Hours	(800) 290-3070 (950) 100-7000

Onsite Personnel

Robert Jurey, Field Leader & HSEO	Office: (514) 424-7140 Mobile: (514) 774-0311
Bernard Hunselshack, HSEO/CH	Office: (514) 424-4000 Mobile: (514) 582-3400
Ryan Wozniak, Advisor-CHSEO	Office: (514) 424-3000 Mobile: (514) 582-2170

Clara Zimmerman, Project Manager

Phone: (818) 424-3779
Mobile: (914) 462-8227

ELSG Personnel

Richard Smith, Alternate EMSG

Office: (520) 948-0790
Mobile: (320) 583-8842

Key Points of Contact

Wilson Doctor, RPM
Maha Orpila, Contracting Officer
Cory Morelana, EMSG Office
Derek R. Smith, EMSG Office

Office: (408) 532-4014
Office: (408) 532-0846
Office: (408) 493-9524
Office: (408) 493-9636

Section 3.0: SPILL AND DISCHARGE CONTROL

Spill and Discharge Control has been developed to prevent the contamination of soils, water, unconfined atmosphere, equipment, material, by the release of a hazardous substance or material in an uncontrolled manner. The California Office of Emergency Services will be notified immediately of any spill or release at (800) 452-7330.

The following spill control equipment will be made available at all times:

- Clay leep litter or other appropriate spill absorbent material
- 55-gallon drum(s)
- Shovels
- Decontamination supplies and protective clothing
- American National Standards Institute (ANSI)-approved portable eyewash station.

Regardless of the type of spill (liquid or solid), the following measures will be taken to isolate the spilled material(s):

- Isolate and contain the hazardous spill area.
- Restrict access of unauthorized personnel.
- Prevent contact with the spilled material.
- Schedule removal and disposal of the spilled material.

Section 3.0- MEDICAL SURVEILLANCE

Battelle's Medical Surveillance Program is based on the requirements outlined in 29 CFR 1910.150 and 1910.154.

3.1 Contents of Medical Examination

All Battelle and subcontractor project personnel working on-site will have employee either a baseline or annual medical monitoring examination within 12 months prior to participation in fieldwork. Battelle field representatives participate in a medical screening program which is performed by a qualified physician (or, if certified in occupational medicine). Medical screening is conducted prior to employment and annually thereafter and consists of the following:

- Medical and occupational history
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood (cholesterol, hepatic, renal, and nervous systems)
 - Urinalysis
 - Blood analysis
 - Pulmonary function test (for respirator users)
- Additional tests including
 - Hearing test
 - Vision test
 - Electrocardiogram

Medical approval is required for personnel who need to wear respiratory protective equipment. During an annual physical, the medical evaluator will determine an individual's physical fitness for respirator use. Based on this examination, the physician will certify in writing whether the individual is capable of full participation on the project, or whether that person must work within certain restrictions. Personnel may be excluded from the project for medical reasons. Any person suffering a lost-time injury or illness must have medical approval prior to returning to work.

3.2 Record Keeping

All medical records must be maintained by the employer for a period of at least 20 years after the employee's termination of employment, in accordance with Occupational Safety and Health Administration (OSHA) regulations on record-keeping and record keeping.

If required, prior to the initiation of work, subcontractors will submit copies of medical fitness certificates to the Battelle Site Health and Safety Officer (SHSO) for each employee to be assigned to the site. The certificates will state that the employee has received a medical examination within the previous 12 months and has been determined fit to perform on-site work.

Section 100- TRAINING

As required by Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1910.120 and 1910.1200 (2 table)) all Stateline and subcontractor personnel involved in hazardous waste site operations are required to receive an initial 40 hours of health and safety training and refresher training annually thereafter. All site personnel will complete this general (not-site-specific) training before assignment to the project. Stateline is responsible and accountable for ensuring that Stateline staff are trained and qualified to carry out their assigned responsibilities on this project.

In addition, the on-site management, supervisor, and Site Health and Safety Officer (SHSO) will receive additional specialized hazard site waste operations management. This training will include but will not be limited to the following:

- + The employer's Health and Safety program
- + Hazard Communication Program
- + Associated employee-training program
- + Personal protective equipment (PPE) program
- + Spill containment program
- + Health-based monitoring procedures and techniques
- + Contingency/contingency (CPR) First Aid, and bloodborne pathogen control training
- + OSHA 10-hour for construction
- + For-site-specific training

Copies of the certificates for the completion of all training for all workers on-site will be kept on a file by the SHSO. Workers without such certification will not be allowed to work at the site. Prior to commencement of field operations at the project site, personnel will receive site-specific training (briefed in the future safety meeting). This training will include a review of all information contained in the SHSO's with particular emphasis on the following:

- + Types and anticipated levels of hazardous substances known to be present on-site, their permissible exposure limits (PELs), health effects, and exposure routes
- + The need for PPE
- + The importance of maintenance and attention to proper fit of PPE
- + Procedures decontamination procedures
- + Safe work practices such as proper site entry and egress, and proper hygiene / using food and water breaks
- + Recognition, as oneself and others, of physical conditions requiring immediate medical attention, especially heat stress, and simple first-aid application measures
- + Procedures to be followed in case of emergencies

In addition, to the 40-hour training, Stateline personnel involved in the field operations will have had an at least three days of supervised field experience on similar kinds of projects.

Section 11.9: A DVERSE WEATHER CONDITIONS

In case of adverse weather conditions, the Project Manager or Site Health and Safety Officer (SHSO) will determine if work can continue without endangering the health and safety of the field workers. The SHSO will monitor the weather during the morning and afternoon hours and will document it in the field logbook. Some of the steps to be considered prior to determining the continuance of work are:

- Potential for heat stress and heat-related injuries
- Dangerous weather-related working conditions (high winds, frost, storms)
- Limited visibility
- Potential for electrical storm/thunder lightning: no outdoor activities will be permitted during electrical storms

Section 22.9 REFERENCES

- American Conference of Governmental Industrial Hygienists (ACGIH). 2005. Threshold Limit Values and Biological Exposure Indices.
- American Red Cross. Community First Aid and Safety Manual.
- Article. 2004a. Safety & Industrial Hygiene Personal Protection Equipment Program (SIP-PP-001). January.
- Article. 2004b. Safety & Industrial Hygiene Respiratory Protection Program (SIP-PP-002). March.
- Article. 2005a. Environment, Safety, Health and Quality (ESHQ) Training Program (TEHC-PP-001). January.
- Article. 2005b. Safety & Industrial Hygiene Accident/Incident Reporting and Investigation Program (SIP-PP-003). April.
- Article. 2005c. 2005c. Safety & Industrial Hygiene Chemical Safety Information Program (SIP-PP-005). September.
- National Institute for Occupational Safety and Health (NIOSH). 1981. Occupational Safety and Health Guidelines for Chemicals. Publication No. 31-123. Revised 1988. Publication No. 35-118. Revised 1995. Publication No. 35-104. Revised 1995. Publication No. 32-119. Revised 1995. Publication No. 35-121.
- Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Manuals Title 29-CFR Parts 1910 and 1926. U.S. Department of Labor.
- Occupational Safety and Health Administration (OSHA). 1995. Occupational Safety and Health Guidelines Manual for Hazardous Waste Site Activities. NIOSH/OSHA/ESP/555G. DHHHS (NIOSH) Publication No. 95-113.
- United States Army Corps of Engineers (USACE). 2002. Safety & Health Requirements Manual. 202-1. November.
- United States Environmental Protection Agency (USEPA). 1992. U.S. EPA. Office of Emergency and Remedial Response. National Operating Safety Codes. OSW202. Document 202-1-010. U.S. Government Printing Office, Washington, D.C. June.
- United States Navy. 2006. Navy/Marine Corps Installation Restoration Manual. Revised August.

ATTACHMENT 1
ACCIDENT PREVENTION PLAN

FINAL

**ACCIDENT PREVENTION PLAN
FOR ADDENDUM NO. 2 TO SITE 14 SOUTH CORRECTIVE ACTION
PLAN AND ASSOCIATED WORK PLAN FOR UNDERGROUND
STORAGE TANK INTEGRITY TESTING AND ADDITIONAL SITE
ASSESSMENT**

**FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA**

Contract No. 940701 01 0 000

Task Order No. 0017

DCE BATL 0000 0017 0000

Prepared for:

**BRAC PMO West
1400 Truman Road, Suite 100
San Diego, CA 92160**

Prepared by:

**Battelle
540 King Ave
Columbus, OH 43260**

February 2000

Personnel assigned to this project will need to be familiar with the possible hazards involved, the safety procedures, and other information outlined in this plan. Prior to the commencement of work, the Project Manager/State Safety and Health Officer will discuss additional precautions to be implemented (addressing any other site specific conditions that may arise). All on site personnel from Potlatch and all subcontractors must sign the Plan Acknowledgment Form found in Appendix A.

APPROVAL PAGE

1. A

Plan Preparation


Robert Janczy, Project Field Leader

Battle
(614) 424-3160

Plan Approval


Mike Ziemann,
Project Manager

Battle
(614) 424-3779

Plan Concurrence


Bernard Hromadsky, CH
Battle Safety and Health
Representative

Battle
(614) 424-4332

CONTENTS

APPROVAL PAGE	iii
FOREWORD	iv
TABLES	vi
APPENDICES	vii
ACRONYMS AND ABBREVIATIONS	viii
1.0 BACKGROUND INFORMATION	1
2.0 STATEMENT OF SAFETY AND HEALTH POLICY	3
3.0 RESPONSIBILITIES AND LINES OF AUTHORITIES	4
4.0 SUBCONTRACTORS AND SUPPLIERS	7
5.0 TRAINING	8
6.0 SAFETY AND HEALTH INSPECTIONS	9
7.0 SAFETY AND HEALTH VIOLATIONS, INCENTIVE PROGRAM, AND COMPLIANCE	10
8.0 ACCIDENT REPORTING	11
9.0 MEDICAL SUPPORT	12
10.0 PERSONAL PROTECTIVE EQUIPMENT	13
11.0 PLANTS REQUIRED BY THE SAFETY MANUAL	17
12.0 CONTRACTOR INFORMATION	18
13.0 SITE SPECIFIC HAZARDS AND CONTROLS	18

FIGURES

Figure 1 Site Location Map	2
Figure 2 Map and Driving Directions to El Cerrito Hospital	14

TABLES

Table 1 Project Contact List	4
Table 2 Emergency Hotlines/Contact List	12
Table 3 Task Specific Personal Protective Equipment	13

APPENDICES

- Appendix A: Plan Acknowledgment and Daily Safety Inspection Forms
- Appendix B: Occupational Safety and Health Administration (OSHA) Forms
- Appendix C: Safety Hazards and Safety Programs and Procedures
- Appendix D: Fire Protection and Evacuation Procedures

ACRONYMS AND ABBREVIATIONS

ABA	Atomic Hazard Analysis
APP	Accident Prevention Plan
CBI	Certified Individual Inspection
CIC	consistency of concerns
COB	Contracting Officer's Representative
CWP	Contingency Work Product
EMR	Experience Modification Rate
HA/SF	Health and Safety Plan
HSS	Health and Safety Officer
IDW	Investigation, Denial, Waive
MTA	Minor Training Activities
OSHA	Occupational Safety and Health Administration
PPE	Personal Protection Equipment
PRCC	Principal Officer in Charge of Construction
PFM	Principal Project Manager
SEER	Safety, Health and Emergency Response
SHSO	Site Health and Safety Officer
USACE	U.S. Army Corps of Engineers

1.0 BACKGROUND INFORMATION
(EPA 305.3-1, Appendix A, Section II)

The following provides information regarding the contractor, contractor information, and project information:

Contractor Details

Contract Number: M01F111010-0009/Task Order: 017

Project Name: Undergo and storage tank (UST) Piping Integrity Testing and Additional Site Assessment Activities at Site 14 South, Moffett Field, California

Brief Project Description: Site 14 South is an unmanned, self-service fuel station located at Moffett Field (Figure 1). Past use of the facility resulted in a release of gasoline to groundwater. The site is currently used as a storage vehicle including fuel tank, and contains two fuel-dispenser islands, an atmosphere building, and two 12,000 gallon, double-walled, fiberglass USTs. The scope of this effort is to perform tank integrity and leak testing on the existing UST piping at Site 14 South to determine if an ongoing leak is occurring. Subsequently, additional groundwater monitoring wells will be installed and sampled along with selected existing wells to further characterize the lateral and vertical extent of groundwater petroleum hydrocarbon constituents of concern (CHCs) present at the site.

Contractor As called, BGS services (BGS) has performed numerous field investigation projects and has an excellent accident prevention record, as shown in the attached Occupational Safety and Health Administration (OSHA) 305A form (Appendix F). BGS has had an Employee Misbehavior Rate (EMR) (years of 2017 and 2018 for 2021 and 2022, respectively). These rates are similar to the national average of 1.1 for all companies performing similar types of work. The BGS team will work to prevent accidents during this project by following BGS Safety Policy, Risk Accident Prevention Plans, and the U.S. Army Corps of Engineers (USACE) Manual, EM 385-1-1. BGS's Columbia Operations OSHA 305 log for the past five years are included in Appendix G.

Phases of Work and Hazardous Activities requiring Activity Hazard Analysis (AHA): The tasks requiring AHA are:

- Mobilization – Transportation and organization of personnel and equipment at the field site
- Tank piping integrity testing – UST piping will be tested to determine whether any leaks are present
- Scan Logs to and Mark Utilities – Site survey to locate and mark subsurface utility corridors
- Groundwater Monitoring Well Installation – Drilling and installing monitoring wells
- Well Development – Pump well after installation
- Equipment Decontamination – Dust and oil particles will be removed from the sampling equipment between sampling events
- Investigation-Related Waste (IRW) Handling – Limited to the proper disposal of sampling equipment

- **Well Location Survey** – Conduct survey to determine the location/elevation of the newly installed well.
- **Groundwater Sampling** – Measuring groundwater levels, gauging the wells, and collecting samples.
- **Demobilization** – Removal of equipment and departure of personnel from the field site.

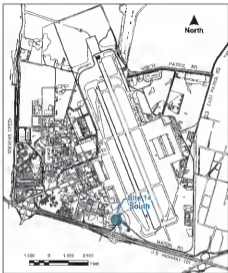


Figure 1. Site Location Map

The operational aspects of the DST piping integrity testing activities will be completed by Technology staff members with oversight by KJVS, Inc. The hazard risk assessment provided in the following section is for the risks that might be encountered by KJVS, Inc. and Technology field personnel while working onsite during the testing activities.

The operational aspects of the groundwater monitoring well installation will be completed by Moore Trenching Associates (MTA). The hazard risk assessment provided in the following section is for the risks that might be encountered by the drilling crew working onsite during drilling activities.

The operational aspects of the groundwater sampling activities will be completed by Technology staff members. The hazard risk assessment provided in the following section is for the risks that might be encountered by Technology field personnel while working onsite during groundwater sampling activities.

Other hazards associated with this project will be assessed in detail and mitigation procedures listed in the Health and Safety Plan (HASP).

Hazards Associated with Mobilization and Demobilization. The most hazards associated with mobilization and demobilization of field personnel and equipment are general site hazards such as slips/trips/falls and truck/pail hazards from materials.

Hazards Associated with Tank Piping Integrity Testing. Hazards associated with the pipe testing work include fuel or gas potential during testing, potential fire when groundwater gas discharge during testing, and equipment compromised has potential to leak fuel during gas introduction due to testing of 100% of normal operating pressure.

Hazards Associated with Groundwater Monitoring Well Installation. Drilling activities such as push/pulls, hole size machinery, mixing parts, slips/trips/falls, and more are all potential risks associated with well installation.

Hazards Associated with Groundwater Monitoring Sampling. The most hazard associated with groundwater sampling is direct contact with site contaminants.

Hazards Associated with Equipment Demobilization. The most hazard associated with equipment demobilization is direct contact with site contaminants.

Hazards Associated with HSW Handling. The primary hazards associated with HSW are direct contact with site contaminants, handling slips/trips/falls, push/pulls, and loading/unloading hazards from trucks.

2.0 STATEMENT OF SAFETY AND HEALTH POLICY

Bechtel's Safety, Health and Emergency Program (SHEP) Department develops, implements, and manages Bechtel's industrial hygiene, industrial safety, and emergency management programs that are fully integrated with Bechtel's operational departments and provide the services and support necessary to maintain compliance with corporate policies and procedures, as well as applicable regulations and industry standards and policies. The SHEP staff members work with members to assist them with health and safety compliance. The ultimate responsibility and accountability for compliance and staff safety falls upon Bechtel department managers and the staff members themselves.

Bechtel is committed to establishing and maintaining an accident-, injury- and occupational illness-free environment. Bechtel Corporate Policy 12 Environmental, Safety and Health Program, states "Bechtel values human life above profits and strives to provide a workplace free of occupational injuries and illnesses. Bechtel values the environment and protects it, the public, and future generations from unacceptable risks resulting from its operations." All staff must plan and conduct their work in a responsible manner to create and maintain safe and healthy environments at Bechtel Bechtel facilities and projects. The purpose of this program is to describe the operational framework and guidelines in addressing safety and health issues at Bechtel.

A copy of Bechtel's Health and Safety programs and procedures pertinent to the scope of this field effort can be accessed in Appendix C (attached as a CD in this report).

1.0 RESPONSIBILITIES AND LINE OF AUTHORITY

Throughout this project, definitive roles and responsibilities will be given to individual Weirtec staff members. Table 1 provides the names and title of the staff members involved with this project. Mr. Bernard Hammelbach has responsibility for Weirtec including authority for final approval of all projects complete within this group. The Weirtec Safety, Health and Emergency Response Manager will be consulted as needed during the project and will have final authority in matters relating to health and safety when in question. All site personnel will be briefed and encouraged to report any health and safety violations they observe. Mr. Robert Jansky, the Project Field Team Leader and Site Health and Safety Officer (SHSO), has the overall responsibility of health and safety on the project. He will be assisted by Mr. Ryan Wernick and Mr. Richard Brink, the alternate SHSOs. The SHSD is responsible for day to day safety and health, ensuring compliance with the Accident Prevention Plan (APP), preventing other safety findings, performing daily inspections, noise monitoring, and changes in personal protection equipment (PPE) levels after a consultation with the Corporate Health and Safety Manager. The SHSD will report all safety violations to the Project Manager. Any concerns for health and safety violations will be resolved or discussed with the site.

Table 1. Project Contact List

Name	Title	Phone
Bernard Hammelbach	Weirtec Safety, Health and Emergency Response Representative	Office 404-434-6282
Chris Zimmerman	Project Manager	Office 404-434-3771 Mobile 404-400-7127
Robert Jansky	Project Field Team Leader including Superintendents responsibilities and Site Health and Safety Officer	Office 404-434-7140 Mobile 404-974-1701
Ryan Wernick	Project Quality Control Manager/Alternate Site Health and Safety Officer	Office 404-434-3881 Mobile 404-974-2129
Richard Brink	Alternate Site Health and Safety Officer	Mobile 714-246-2847

4.0 SUBCONTRACTORS AND SUPPLIERS

Technology Inc. will perform the DTT and piping integrity testing activities on this project with oversight by KEMP Inc. (both as sub-contractors). MTA will be subcontracted to perform the drilling and well installation tasks.

All subcontractors and suppliers will be provided with a copy of this APP. Subcontractors will receive the plan with their submittal and each individual will be expected to sign the signature sheet provided in Appendix A, certifying that they have read, understood, and will comply with the requirements of this plan. KEMP Inc., Technology Inc., and MTA will provide their own competent specific programs and a clearly marked worksheet to verify the inclusion in the HAZOP. Subcontractors personnel are expected to attend all daily health and safety briefings while working on the site.

Section requires all subcontractors to work in a responsible and safe manner. Subcontractors for this project will be required to adhere to applicable requirements set forth in the WHMIS Safety, and Health Requirements Manual, EN 203 1-1 (November 2003).

5.0 SAFETY AND HEALTH INSPECTIONS

Safe safety and health inspections will be performed by the CHSD in accordance with EM 390-1-1, Section 50.A.12. All inspections will be thoroughly documented using the Safe Safety Inspection Form provided in Appendix A. The results will be incorporated in the Project Memo per the following flow. These inspections will cover general site hazards, such as the presence and condition of safety supplies, housekeeping and slip/trip/fall hazard potential. All identified deficiencies will be corrected at the time of identification and before work resumes.

**THE SAFETY AND HEALTH EXPECTATIONS, INCENTIVE
PROGRAM, AND COMPLIANCE
SECTION 3, APPENDIX A, SECTION 3)**

Wetita Inc.'s written safety program goals are to maintain a safe work environment that provides the following:

- Reducing the risk of injury, illness, and loss of life to employees
- Maintaining compliance with federal, state and other applicable safety regulations, and encouraging employees' work exposure to potential physical, chemical, biological, and radiological hazards.

Wetita Inc. does not currently have a safety incentive program nor do its subcontractors.

Wetita Inc. is committed to providing a safe workplace for its employees. Thus, the and the Company's Safety and Occupational Health Program have been developed to ensure that its employees' risk of injury is minimized and to ensure their quality of life. Wetita expects all employees to fully comply with all established health and safety policies and to make daily notify their supervisor if they notice a health or safety hazard or someone not complying with established procedures. Violators of the Safety and Health Policies will be disciplined and may be dismissed. Disciplinary action will follow the grievance outline in Wetita's Operating Guide LP-3. Disciplinary Action: General Safety Inspection and Disciplinary Action for Violators.

Health and safety is everyone's responsibility. Each Wetita project supervisor has been entrusted with the responsibility of ensuring that the policies and procedures outlined in Wetita's Health and Safety Program and the Accident Prevention Plan are followed. Each supervisor is to be held responsible for the health and safety of those he or she supervises.

LB ACCIDENT REPORTING

Petrelle will complete the "USACE Contractor Monthly Summary Record of Injuries/Illness and Work Hour Expenses" (for prime and its subcontractors) on the attached form (Appendix B) and forward the completed form to the Contracting Officer's Representative (COR) no later than close of business on the 10th calendar day of the following month. The method of transmission by the prime contractor to the COR shall be electronically. A guide to completing the form is also provided in Appendix B.

All reportable incidents, OSHA reportable incidents, lost time injuries, injuries requiring medical attention, lost, or incidents involving the public, and property damage exceeding \$1,000.00 will be investigated by the SHSD and Project Manager as well as the applicable Petrelle Safety and Health Program Unit in accordance with Petrelle's Accident/Incident Reporting and Investigation Procedures SHD GP 024. In addition to the internal investigation, a verification will be made to the Navy's RPM within 30 hours and a written report of the investigation also will be submitted on EHS Form 1004, Accident Investigation Form (Appendix B), within five working days of the incident.

Fatalities will be reported immediately to the Navy RPM and to Gary Mendenhall, the Resident Officer in Charge of Construction (ROICC). Fatalities and serious injury cases will not be debated until the Navy and Marine Corps have reviewed and completed their internal Process of Investigation and then notified Petrelle that it is satisfactory to resume activities.

8.6 MEDICAL SUPPORT

In the case of minor injuries, Mr. Robert Ramsey, Mr. Peter Wosinski, and Mr. Richard Brack have been trained as First Aid, CPR with AED, and blood borne pathogens and will provide minor first aid on site. The various injuries, all FFI and require emergency medical assistance. Severely injured persons should not be moved, unless they are in immediate danger. Table 2 contains emergency phone numbers. Figure 2 is a site map, a long walk to the firehouse, to the El Centro Hospital, which is the nearest emergency care provider. The expected driving time from the site to the nearest hospital is approximately ten minutes.

Table 2. Emergency Notifications/Contact List

Emergency Sections	
R&A Police Services	911 (Mobile phones) (408) 404 3375 (on Rd) (408) 404 3412 (non-emergency)
Fire	911
Mountain View Fire Station #4 275 N. Whisman Rd Mountain View, CA 94041	(408) 943-4303 (non-emergency)
Firearm Control Center	(800) 833 4766
National Firearm Control Center	(800) 372 1332
National Response Center, Toxic Chemicals and Oil Spills	(800) 424 9332
Medical Centers	
El Camino Hospital 2400 El Camino Rd Mountain View, CA	(408) 940 3000
U.S. BioResource 1101 E. Arques Avenue Beverly Hills, CA	(408) 733 0000
Regulatory Agencies	
U.S. Environmental Protection Agency	(800) 800 2191
California Emergency Response	(800) 360 3673 (800) 832 3536 (after hours)
Battelle Personnel	
Robert Incey, Field Leader A, EHSO	Office (404) 434 7100 Mobile (404) 794 3511
Bernard Henschelrich, H&D/CSE	Office (404) 434-4303 Mobile (404) 340 3400
Faye Wenzel, Alternate EHSO	Office (404) 434 3700 Mobile (404) 379 3378
Chris Zemanian, Project Manager	Phone (404) 434 3776 Mobile (404) 402 8127
CRG Personnel	
Richard Smith, Alternate EHSO	Office (714) 943 0790 Mobile (714) 360 3742
Key Personnel Contact	
Wilson Suter, EPM	Office (407) 522 4014
Melita Depina, Contracting Officer	Office (407) 522-8944
Don, Missionary, POLICE Office	Office (402) 488 9114
Daniel R. Smith, R&D/C Office	Office (402) 488 9136



Figure 3. Map and Driving Directions to El Camino High School

THE PERSONAL PROTECTIVE EQUIPMENT

A hazard assessment of each of the anticipated tasks during the field effort has been performed by Robert Insarp (SHSS). A list of the tasks and the necessary PPE are presented in Table 1. Individuals using PPE have been medically cleared to use such equipment when required and have been trained in accordance with the applicable portions of the Health, Safety and Health Program. Level of training will be maintained on site and will be available for inspection by USAEC representatives.

Table 1. Task Specific Personal Protective Equipment

Task	Activities	Required PPE
Measurement and Site Survey	Transporting persons, personnel and equipment at the site and conduct a site survey to identify potential hazards	Level I.D (safety boots, outside gloves, hard hats, safety glasses, leather gloves, etc.)
UUT and Pipeline Integrity Testing	UUT and pipe testing will be performed using a pump to pressurize the product line and measured using a testing apparatus	Level I.D (safety boots, outside gloves, hard hats, safety glasses, leather gloves, etc.)
Scrub Units and Mask Utilization	Site survey to located and mark the locations of subsurface utility monitors	Level I.D (safety boots, outside gloves, hard hats, safety glasses, leather gloves, hearing protection, etc.)
Groundwater Monitoring Well Installation	Drilling will be performed using a bottom drive weight drilling to subsurface formations for the purpose of installing wells	Level I.D (safety boots, outside gloves, hard hats, safety glasses, leather gloves, hearing protection, etc.)
Well Development	Pump well after installation	Level I.D (safety boots, outside gloves, hard hats, safety glasses, leather gloves, etc.)
Equipment Decontamination	Any contaminated particles on the sampling equipment will be wiped from the sampling equipment using a dry cloth	Level I.D (gloves, boots, outside gloves, hard hats, safety glasses, leather gloves, etc.)
EDW Handling	Sampling equipment and decontamination bags will be disposed in an appropriate manner	Level I.D (safety boots, outside gloves, hard hats, safety glasses, leather gloves, etc.)

Table 3. Task Specific Forms of Protective Equip used (Continued)

Task	Activities	Required PPE
Survey Monitoring W&D Locations	Conduct survey to determine the location elevations of the newly installed wells	Level II (safety boots, hard hats, safety glasses, leather gloves, etc.)
Groundwater Sampling	Groundwater sampling will be performed using a bailer pump. Collection will be placed in the appropriate containers before being sent to the analytical laboratory	Level II (safety boots, safety glasses, hard hats, safety glasses, leather gloves, etc.)
Break Down	Removal of equipment and departure of personnel from the field site	Level II (safety boots, safety glasses, hard hats, safety glasses, leather gloves, etc.)

11.6 PLANS REQUIRED BY THE SAFETY MANUAL

Specific information on Battelle's programs and procedures outlined in the safety manual are contained in Appendix C and are identified as follows:

- **Emergency Response Plan** Presented in the H&SF and titled as Emergency Action Plan (Section 7.8), the emergency action plan contains procedures for:
 - o Communication.
 - o Site Evacuation.
 - o First Aid.
 - o Decontamination during medical emergencies.
 - o Emergency Contact List.
- **Hazard Communication Plan** Battelle's written Hazard Communication Program included Chemical Safety Information Program/has been provided as part of the Health and Safety Program Package. This Program addresses all of the elements required by HCS (1910.1200, Hazard Communication Standard).
- **Site Health and Safety Plan**
- **Bloodborne Pathogens Program**
- **Reporting and Recording Occupational Injuries and Illnesses**
- **Accident/Incident Reporting and Investigation Procedures**
- **Personal Protection Equipment Program**
- **Safety and Health Management Program**

13.9 CONTRACTING INFORMATION

Patella will define the machinery and equipment requirements outlined in Section D of USACE Guidance EOM 313-1-1 titled "Machinery and Mechanical Equipment." Additional requirements describing these requirements outlined in the APP will be met or provided as separate plans as a part the HA/SP or Appendix D and include the following:

- Medical and First Aid requirements – outlined in the HA/SP
- Personal Protection Equipment requirements – outlined in the HA/SP
- Fire Protection and Prevention requirements – attached as Appendix D pertaining to the UST integrity testing

12.6 SITE SPECIFIC BASELINES AND CONTROLS

Potential for losses during pipe testing is the major concern associated with this project. All team members will be invited via daily bridge safety meetings about the dangers with the testing and the steps to mitigate any potential hazards. When hazards and controls associated with the upcoming scope of work are also outlined in tabular format as Table 2-1 of the RASP. Documentation of attendance at these meetings will be provided in the appropriate sub-reporting forms.

APPENDIX A

PLA'S ACKNOWLEDGEMENT AND DAILY SAFETY INSPECTION FORMS

By signing below, the undersigned certify they have had the opportunity to read and ask questions about the AUP, and that they understand the procedures, expectations, and restrictions of this plan and agree to abide by them.

No.	Name	Signature	Date	Company
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

DAILY SAFETY MEETING FORM

Date _____ Time _____ Job Number _____

Client _____ Address _____

Site Location _____

Scope of Work _____

SAFETY TOPICS PRESENTED

Protection Clothing/Equipment _____

Character of Hazards _____

Physical Hazards _____

Special Equipment _____

Emergency Procedures _____

Hospital _____ Phone _____ Ambulance Phone _____

Hospital Address and Route _____

ATTENDEES

NAME (PRINTED)

SIGNATURE

Meeting Conducted by _____ Signed by _____

Site Safety Officer _____ Construction Manager _____

APPENDIX E
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FORMS

Summary Guide for Completing USA/C E Contractor Monthly Summary Report of Injuries/Illnesses & Work Hour Exposure

In accordance with the provisions of ERM 300 1.1, Section 01, Program Management, Paragraph 01.D Accident Reporting and Recording, sub-paragraphs 01.D.05 you (the Prime Contractor) shall provide a monthly record of all exposure and accident experience (accidental to the work) that includes exposure and accident experience of the Prime Contractor and its sub-contractors (1). At a minimum, these records shall include exposure work hours and a record of occupational injuries and illnesses that include the data elements listed below. Definitional criteria for each data element are found in 29 CFR Part 1904. Most of this information can be obtained from the Contractor's OSHA 300 Log.

If the Contractor requires time away and/or work hour exposure change, after the record is submitted to USA/C E Contractor shall provide a revised report to the GDA. In addition, the contractor must complete the USA/C E ERM Form 5394 "Report of Accident Investigation for all recordable accidents. Definitions for recordable accidents are the same as found in 29 CFR Part 1904 and provided below. This monthly report shall be submitted to the GDA within the time limit and in a manner (electronic/ hardcopy) established by the GDA. Unless otherwise specified by the GDA, this form shall be submitted by close of business on the 10th day of the following month.

How do I determine the Standard Industrial Classification (SIC) or North American Industry Classification System (NAICS) code for the person, job, and supply conditions?

You determine the SIC code by using the Standard Industrial Classification Manual and for the NAIC code by using the North American Industry Classification System Manual. Both codes are products of the Executive Office of the President, Office of Management and Budget. You may contact your nearest OSHA office or State agency for help in determining your SIC or NAIC code.

Recordable Injuries/Illness which must be included in the Record

Contractor must keep records of fractures, injuries, and illnesses that are:
Work related
New case
Meet 1 or more of the recording requirements listed below

Death
Days away from Work after the date of injury
Restricted work or transfer to another job
Medical Treatment beyond first aid
Loss of consciousness

Needlestick injuries and cuts from sharp objects contaminated with another person's blood or other potentially infectious material.

Medical removal under medical surveillance requirements of an OSHA

Standard

Occupational hearing loss if the employee has experienced a work-related STS in both ears or both ears and the employee's total hearing level is 25 dB or more above audiometric zero in some cases in the STS

Work-related tuberculous Cases

How do I decide whether a particular injury or illness is recordable?

The decision tree for recording work-related injuries and illnesses below shows the steps involved in making the determination.



When is an injury/illness considered work-related?

An injury/illness is considered work-related if an event or exposure in the work environment caused or contributed to the condition or a significantly aggravated a preexisting condition. Work relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. See 29 CFR Part 1904.51(a)(2) for exceptions.

Land Based Activities

The work environment for USA/CB contractors is defined as the physical location of the project site(s).

Marine Activities

For marine activity (accident reporting only), the contractor's responsibility for reporting work related accidents extends to the following personnel and equipment:

1. Prime Contractor and subcontractor personnel and equipment (P&E) performing work in direct support of the contracted activity. This includes:
 - a. Contractor P&E that have reported on station to a contract defined work area to begin work under project funded pay or subcontract status.
 - b. Contractor P&E at all sites leased or used during contract work for storage, staging, exchange, transiting, or deposit of materials.
 - c. Contractor P&E during mobilization or demobilization under terms of the contract.
2. Service and supply vendors when they come under the direct operational control of a prime or subcontractor vessel master or project superintendent, such as:
 - a. When making final approach to make up to Contractor vessel/plant.
 - b. While their vessels are made up to Contractor vessels, structures, or equipment.
 - c. During delivery of materials or on-board a vessel.
 - d. When coming off and navigating away from Contractor vessel/plant.

What is medical treatment?

Medical treatment includes managing and caring for a patient for the purpose of controlling disease or disorder. The following are not considered medical treatments and are NOT reportable:

- Visits to a doctor or health care professional solely for observation or counseling.
- Diagnostic procedures including administering prescription medications that are used solely for diagnostic purposes, and
- Any procedure that can be labeled first aid.

What is First Aid?

First aid means only those treatments specifically listed in 1904.7. They are:

Using non-prescription medication at non-prescription strength (for medications available in both prescription and non-prescription form, a recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for recordkeeping purposes).

Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment)

Cleaning, flushing or soaking wounds on the surface of the skin

Using wound coverage such as bandages, Band-Aids™, gauze pads, etc., or using butterfly bandages or Steri Strips™ (other wound closing devices such as sutures, staples, etc. are considered medical treatment)

Using hot or cold therapy

Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for recordkeeping purposes)

Using temporary immobilization devices while transporting an accident victim (e.g. splints, slings, neck collars, back boards, etc.)

Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister

Using eye patches

Removing foreign bodies from the eye using only irrigation or a cotton swab

Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means

Using finger guards

Using massages (physical therapy or chiropractic treatment are considered medical treatment for recordkeeping purposes) or

Drinking fluids for relief of heat stress.

How do you decide if the case involved restricted work?

Restricted work activity occurs when, as the result of a work-related injury/illness, an employer or health care professional keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred.

How do you count the number of days of restricted work activity on the number of days away from work?

Count the number of CALENDAR days the employee was on restricted work activity or was away from work as a result of the recordable injury/illness. Do not count the day on which the injury/illness occurred in this number. Begin counting from the day after the incident occurs. If a single injury/illness involving both days away from work and days on restricted work activity, enter the total number of days for each. You may stop counting days of restricted work activity or days away from work once the total of either or the combination of both reaches 180 days.

What if the outcome changes after the record is submitted to the GDA?

If the outcome or extent of injury/illness changes after the record has been submitted to the GDA, the record should be revised and resubmitted to the GDA on or before the date the subsequent monthly record is to be submitted.

What is an injury?

An injury is any wound or damage to the body resulting from an event in the work environment.

Examples: Cuts, puncture lacerations, abrasions, fracture, bruise, contusion, clipped tooth, amputation, insect bite, electrocution, or a thermal, chemical, electrical, or radiation burn. Sprain and strain injuries to muscles, joints, and connective tissues are classified as injuries when they result from a slip, trip, fall or other similar accidents.

What is an illness?

Skin diseases or disorders

Skin diseases or disorders are illnesses involving the worker's skin that are caused by work exposure to chemicals, plants or other substances.

Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; edema; friction blisters; chronic ulcers; inflammation of the skin.

Respiratory conditions

Respiratory conditions are illnesses associated with breathing hazardous biological agents, chemicals, dust, gases, vapors, or fumes at work.

Examples: Silicosis, asbestosis, pneumoconiosis, pleurisy, asthma or acute congestion, farmer's lung, bronchium disease, tuberculosis, occupational asthma, reactive airways dysfunction syndrome (RAADS), chronic obstructive pulmonary disease (COPD), hypersensitivity pneumonitis, toxic inhalation injury, such as metal fume fever, chronic obstructive bronchitis, and other pneumoconiosis.

Poisoning

Poisoning includes disorders induced by abnormal concentrations of toxic substances in blood, other tissues, other bodily fluids, or the breath that are caused by the ingestion or absorption of toxic substances into the body.

Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by heat and local carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays, such as parathion or lead arsenate; poisoning by other chemicals, such as formaldehyde.

Hearing loss

Noise-induced hearing loss is defined for recordkeeping purposes as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in either ear at 2,000, 3,000, and 4,000 hertz, and the employee's totally hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2,000, 3,000, and 4,000 hertz) in the same ear(s).

All other diseases

All other occupational diseases.

For example: Heatstroke, sunstroke, heat exhaustion, heat stress, and other effects of environmental heat; freezing, frostbite, and other effects of exposure to low temperatures; decompression sickness; effects of ionizing radiation; leukopenia; radon; effects of nonionizing radiation (welding flash, ultra violet rays, laser); anthrax; bloodborne pathogenic diseases, such as AIDS, HIV, hepatitis B or hepatitis C; brucellosis; malignant or benign tumors, neoplasms, neurodegenerative.

How do you determine the total hours worked by all employees?

Land Based Activities

Include hours prime and sub-contractor employees worked on the project work site by selected hourly, part time, and seasonal workers, as well as hours worked by other workers subject to the day in day supervision by prime and sub-contractor employees (for example temporary help services workers). Also include the hours worked by supply contractor employees associated with materials services or equipment provided by suppliers (example: concrete supply drivers and helpers delivering concrete for placement) on the work site; dump truck drivers while on site delivering or removing materials; other supply contractor employees who are performing on on site service while on the project work site.

Marine Activities

For marine activity reporting only, the contractor's responsibility for reporting work related hours of exposure extends to the following personnel and equipment:

1. Prime Contractor and subcontractor personnel and equipment (P&E) performing work in direct support of the contracted activity. This includes:
 - a. Contractor P&E that have reported on station in a contract defined work area to begin work under project funded pay or subcontract status.
 - b. Contractor P&E at all sites leased or used during contract work for storage, staging, anchorage, transiting, or deposit of materials.
 - c. Contractor P&E during mobilization or demobilization under terms of the contract.

2. Service and supply vendors when they come under the direct operational control of a prime or subcontractor vessel, number of project superintendent, such as:

- When making final approach to make up to Contractor vessel/plant.
- While their vessels are made up to Contractor vessels, structure, or equipment.
- During delivery of materials on or board a vessel.
- When casting off and navigating away from Contractor vessel/plant.

Do not include vacation, sick leave, holidays, or any other non-work time, even if employees were paid for it. If the contractor keeps records of only hours paid or if the contractor has employees who are not paid by the hour (salaried employees), estimate the hours that the employees actually worked on the project.

If the numbers are available, you can use the optional worksheet to estimate it.

Optional Worksheet

_____	Find the number of all prime and sub contractor full-time employees on the project who, as defined above for both Lead-based and marine activities for the month.
X _____	M ultiply by the number of work hours for a full-time employee in a month.
_____	This is the number of full-time hours worked.
+ _____	A dd the number of any overtime hours as well as the hours worked by other employees (part-time, temporary, seasonal, supply contractors, etc.)
_____	R ound the answer to the next highest whole number. Write the rounded number in the Monthly Exposure Hours block.

Summary of Work-Related Injuries and Illnesses

Year 2000



U.S. Department of Labor
Occupational Safety and Health Administration

Keep copies of this form in your files

Instructions: Complete Form 300A (Rev. 01/2000) once you fill out the Summary page. You may report on illnesses occurred during the year. If an injury or illness is not on the list in this form, the injury can be recorded.

When the last available calendar date is reached, record the injury. When the last available date is reached, record the injury. When the last available date is reached, record the injury.

Instructions: Complete Form 300A (Rev. 01/2000) once you fill out the Summary page. You may report on illnesses occurred during the year. If an injury or illness is not on the list in this form, the injury can be recorded.

Number of Cases			
Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other non-fatal cases
0	1	14	10
00	01	14	10

Number of Days	
Total number of days away from work	Total number of days of job transfer or restriction
21	20
01	20

Injury and Illness Types			
Total number of cases		Total number of cases	
(1) Injury	40	(4) Other Injury	0
(2) Skin Diseases	1	(5) Hearing Loss	0
(3) Respiratory Diseases	0	(6) All Other Diseases	0

Post this Summary page from February 1 to April 1 (and the year following the year covering the form)

When reporting injuries and illnesses, employers should use the following instructions: (1) Injuries and illnesses should be reported to the nearest OSHA office. (2) Injuries and illnesses should be reported to the nearest OSHA office. (3) Injuries and illnesses should be reported to the nearest OSHA office. (4) Injuries and illnesses should be reported to the nearest OSHA office.

Establishment information

Establishment name Johns Hopkins University

Street 3501 E. University Ave.

City Baltimore State MD Zip 21205

Industry description (NAICS) Health care and social assistance
Research and development in health care

Statistical Industrial Classification (SIC) 8062 (Health care)

ICD-10 code (International Classification of Diseases) 8062.21

1 2 3 4 5 6 7 8 9 0

Employment information

Annual average number of employees 1000

Total hours worked by all employees last year 400,000

Sign here

When you sign this document, you certify that:

I certify that the information provided is true and correct to the best of my knowledge. I certify that the information provided is true and correct to the best of my knowledge.

Signature Johns Hopkins University Title President

Date 01/01/00 Title President

OSHA's Form 300a

Summary of Work-Related Injuries and Illnesses

[illegible]

Age Group	Percentage of Respondents
18-29	85%
30-39	80%
40-49	75%
50-59	70%
60-69	65%
70-79	60%
80+	65%

Table 1

1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 26

Abstract—The authors examined the effect of a 10-min, low-intensity, low-velocity warm-up on the performance of a 10-min, high-intensity, high-velocity warm-up. The authors hypothesized that the low-intensity, low-velocity warm-up would improve the performance of the high-intensity, high-velocity warm-up. The results showed that the low-intensity, low-velocity warm-up did not improve the performance of the high-intensity, high-velocity warm-up. The authors concluded that the low-intensity, low-velocity warm-up is not necessary before a high-intensity, high-velocity warm-up.

Along the way, you'll be able to make changes to your site in real time. There's even the ability to add new content without the assistance of a web master or the like. It's not just a great way to get started.

reality, and human experience, and their most powerful source the spirit among the Gypsies. These people are not "other" people in the Gypsy sense, but they are "othered" by the dominant culture. The Gypsies must be seen as a people who are not "othered" by the dominant culture, but who are "othered" by the dominant culture.

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

Total number of donations	Total number of a case in the days surrounding onset	Total number of cases in the 14 days prior to onset	Total number of other associated cases
(i)	(c)	(b)	(d)
100	100	90	90

1000

Total number of days of job transfer as executives	18.5
	<u>2</u>
Total number of days as executives	20
	<u>2</u>

100

Total number of BIB	
(1) Injury	23
(2) Non-Injury	7
(3) Suspended	
(4) Death	

David Hays (Baltimore) wrote from February 1 to April 1861 of the war following with us as we called the fire I saw

Public, including Justice for the Victims of Terrorism, is confident it is possible to release the information, including the names of the victims, and provide the data needed to complete and value the information collection. However, we are dependent on the FBI's collection of the data, which is subject to a number of FBI control issues. If Justice can determine that the release of the information is in the public interest, we will release the information.

Abstract

11. *Journal of the American Medical Association*, 2000; 284: 1039-1044.

00000000 **00000000** **00000000** **00000000**

[illegible]

1000

© 2006 The Authors
Journal compilation © 2006 Blackwell Publishing Ltd

[illegible]

Journal of Management Inquiry 22(1) 3-14

© 2000 Blackwell Science Ltd *Journal of Internal Medicine* 247: 399–406

100

11. *Journal of the American Medical Association*, 273: 2221-2226, 1995.

Copyright © 2005 Pearson Education, Inc. All rights reserved. Printed in the United States of America. This publication is protected by copyright. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage or retrieval system, without permission in writing from Pearson Education, Inc.

100

10

[illegible]

100

Monthly Record of Work-related Injuries/Illnesses & Exposure

Response	Percentage
Yes, the current system is the best way to run the country	60%
No, the current system is not the best way to run the country	40%



© 2008 by The McGraw-Hill Companies, Inc.

[illegible]

Abstract

1000

[illegible]

100

APPENDIX C

BATTELLE HEALTH AND SAFETY PROGRAMS AND PROCEDURES

Battelle Science & Technology International Safety, Health And Emergency Response

Title Bloodborne Pathogen Program

Number SH-QP-01

Revision 00

Originator


Eric J. Gunglach


Date

Adviser, Safety Health And Emergency Response

Approved By


Donald W. Cagle


Date

Manager, Safety, Health And Emergency
Response and agency, for the BSTI Safety
Committee Chairperson

Approved By


Mark E. Jackson


Date

Manager, Regulatory Compliance

Approved By


N. Joseph Garafalo


Date

Manager, BSTI Environmental, Safety, Health and
Quality

TABLE OF CONTENTS

1.0 PURPOSE	1
2.0 SCOPE AND APPLICABILITY	1
3.0 PREREQUISITES	1
4.0 DEFINITIONS	1
5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES	3
6.0 RESPONSIBILITIES	3
6.1.0 Manager Safety, Health, and Emergency Response	3
6.1.1 Safety and Health Representatives	4
6.1.2 Line Management	4
6.1.3 King Avenue and West Jefferson Health Services	4
6.1.4 Staff Members	4
6.1.5 Training Database Coordinator	4
7.0 PROCEDURES	5
7.1.0 Exposure Control Plans	5
7.1.1 Exposure Determination	5
7.1.2 Physical Examinations	5
7.1.3 Sharps Injury Logs	5
7.1.4 Precautions for Staff Members and Preventative Measures	6
8.0 MEDICAL MANAGEMENT POST-EXPOSURE REVIEW	6
8.1.0 Post-Exposure Evaluation	6
8.1.1 Post-Exposure Follow-up	10
9.0 TRAINING	11
10.0 RECORDS	12
10.1.0 Program Records	12
10.1.1 Changes in Technologies that eliminate or reduce biohazardous pathogens	12
10.1.2 Training records	12
10.1.3 Medical Records	12
10.1.4 Confidentiality/Strictly Private	12
10.1.5 Maintenance of Records	12
11.0 Related Documents	13
Appendix A: Sample Exposure Control Plan	14
Appendix B: Forms	16

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	05/13/94	Initial release
0	06/07/95	Yearly review completed - no changes

1.0 PURPOSE

- 1.0.1 The Battelle Science and Technology International (BSTI) Bloodborne Pathogens Program establishes responsibilities, describes procedures for preventing exposures to bloodborne pathogens, and describes actions to be taken in the event of a bloodborne pathogen exposure.
- 1.0.2 This program does not fully address the requirements for hepatitis B virus (HBV) and human immunodeficiency virus (HIV) research and protection facilities. If research or work of this nature is undertaken, additional requirements of 29 CFR 1910.1039(a) and Center for Disease Control National Institute of Health (CDC/NIH) 93-8095 shall be developed and implemented by the line management and the assigned Safety and Health Representative.

1.0 SCOPE AND APPLICABILITY

- 2.0.1 This program applies to Battelle Science and Technology International (BSTI) staff that are exposed or may potentially be exposed to bloodborne pathogens (BBP) during the course of their work.

1.0 PREREQUISITES

- 3.0.1 In order to perform work with BBP employees must be trained as described in section 9.0 of this procedure and must have been offered a Hepatitis B Vaccination.

4.0 DEFINITIONS

- Approved Medical Facility:** A medical facility and its staff that have been reviewed and approved for use by the BCG Health Services organization.
- Blood:** Human blood, human blood components, and products made from human blood.
- Bloodborne Pathogens:** Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
- Clinical Laboratory:** A workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials.
- Contaminated:** The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.
- Contaminated Laundry:** Laundry that has been soiled with blood or other potentially infectious materials or that may contain sharps.
- Contaminated Sharps:** Any contaminated object that can penetrate the skin, including, but not limited to, needles, scalpels, broken glass, broken or ciliary tubes, and exposed ends of dental wires.
- Decontamination:** The use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Engineering Controls Controls (e.g. sharps disposal containers, self-sharpening needles, safer medical devices, such as, sharps with engineered sharps injury protections and needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace.

Exposure Incident—A specific eye, mouth, other mucous membrane, non-intact skin, or percutaneous contact with blood or other potentially infectious materials that results from the performance of a staff member's duties.

Hand-Washing Facilities A facility providing an adequate supply of running potable water, soap, and single use towels or hot air drying machines.

Licensed Healthcare Professional A person whose legally permitted scope of practice allows him or her to independently perform the activities required by paragraph (f) 1)(c) 8)(1)(g)–(8)(P) Standard, Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up.

HBV Hepatitis B Virus.

HIV Human Immunodeficiency Virus.

Occupational Exposure—Reasonably anticipated skin, eye, mucous membrane, or percutaneous contact with blood or other potentially infectious materials that may result from the performance of a staff member's duties.

Other potentially infectious materials

The following human body fluids/semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids:

- 1) Any unfixed tissue or organ (other than intact skin) from a human (living or dead)
- 2) HIV or HBV containing cell or tissue cultures, organ cultures, and HIV or HBV containing culture medium or other solutions, and blood, organs or other tissues from experimental animals infected with HIV or HBV

Percutaneous Piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and lacerations.

Personal Protective Equipment Specialized clothing or equipment worn by a staff member for protection against a hazard. General work clothes (e.g. uniforms, pants, shirts or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

Regulated Waste Liquid or semi-liquid blood or other potentially infectious materials, contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed, items that are caked with dried blood or other potentially infectious materials and are capable of releasing

these methods during handling: contaminated sharps and pathological and microbiological wastes containing blood or other potentially infectious materials

Sharps with Engineered Sharps Injury Protection (SESIP) – A non needle sharp or a needle device used for withdrawing body fluids, accessing a vein or artery, or administering medications or other fluids, with a built in safety feature or mechanism that effectively reduces the risk of an exposure incident.

Source Individual – Any individual (living or dead) whose blood or other potentially infectious material may be a source of occupational exposure to the staff member. Examples include, but are not limited to: hospital and clinic patients; clients in institutions for the developmentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains; and individuals who donate or sell blood or blood components.

Sterilize – The use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Universal Precautions – An approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

Work Practice Controls – Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- U.S. Department of Labor/Occupational Safety and Health Administration (OSHA) Bloodborne Pathogen Standard, 29-CFR 1910.1033
- NIOSH (1988) Publication No. 88-119 for Protecting the Safety and Health of Health Care Workers, U.S. Department of Health and Human Services, Centers for Disease Control.
- NIOSH (1989) Publication No. 89-148 A Curriculum Guide for Public Safety and Emergency Response Workers/Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus, U.S. Department of Health and Human Services, Centers for Disease.
- U.S. Department of Health and Human Services, Center for Disease Control, CDC MM, 4th Edition, Breviary in Microbiological and Biomedical Laboratory, NIOSH Publication No. (CDC) 93-1036.
- State of Ohio Environmental Protection Agency (Ohio EPA) Infectious Waste Regulations, Ohio Administrative Code (OAC) 3745-27, Division of Solid and Hazardous Waste Management.

6.0 RESPONSIBILITIES

6.1.0 Manager, Safety, Health, and Emergency Response

- 6.1.0.1 Provide oversight of program effectiveness and applicability to B571 functions.

6.1.1 Safety and Health Representatives

- 6.1.1.1 Provide assistance to Line Management in the performance of exposure determinations, project and operation specific training and, where necessary, the development of project- and operation-specific exposure control plans.
- 6.1.1.2 Annually assess the effectiveness of exposure controls such as work practices, engineering controls and personal protective equipment.
- 6.1.1.3 Assist line management with the annual review of project- and operation-specific exposure control plans.

6.1.2 Line Management

- 6.1.2.1 Ensure that project specific exposure control plans are developed, documented and maintained where required.
- 6.1.2.2 Ensure that staff are trained in both general exposure controls and controls necessary for project specific operations and projects.
- 6.1.2.3 Ensure that exposure determinations are made for all staff and that a list of individuals who potentially may be exposed to bloodborne pathogens is maintained.
- 6.1.2.4 Ensure that staff understand how and to whom to report exposure events.
- 6.1.2.5 Ensure that exposure events are investigated under to SH-CP 02 Accident and Incident Investigation Program).

6.1.3 King Avenue and West Jefferson Health Services

- 6.1.3.1 A written review, recommendation and approval of medical facilities for use by regional offices.
- 6.1.3.2 Ensure that sharps injury logs and medical files for King Avenue and West Jefferson Offices are maintained.

6.1.4 Staff Members

- 6.1.4.1 Notify line manager and Safety and Health representative and report potential exposures immediately to an approved medical facility.

Note: King Avenue and West Jefferson staff should report immediately to Health Services.

- 6.1.4.2 Provide input upon solicitation from Safety and Health Representatives regarding work practices and Sharps with Engineered Sharps Injury Protection (SESIP) injury events and other recommendations for injury control.

6.1.5 Training Database Coordinators

- 6.1.5.1 Maintain training records.
- 6.1.5.2 Training records shall be kept for 3 years from the date that training occurred.
- 6.1.5.3 Upon request, training records shall be provided for copying purposes to staff members, staff member representatives, and Director and Assistant Secretary of Labor in accordance with 29 CFR 1910.20 and 1910.1030.

7.0 PROCEDURE

7.1.0 Exposure Control Plans

- 7.1.0.1 Line management or designee shall develop exposure control plans to address project- and operation-specific hazards. (Refer to Appendix A, "Sample Exposure Control Plan.")
- 7.1.0.2 Exposure control plans and the BSTD Bloodborne Pathogens Program shall be reviewed annually to reflect new or modified tasks and procedures that affect occupational exposure.
- 7.1.0.3 The annual review shall include the solicitation of input from non-managerial staff members who are potentially exposed to injuries from contaminated sharps in the identification, evaluation, and selection of effective engineering and work practice controls.

7.1.1 Exposure Determination

- 7.1.1.1 Line Management or designee for each department that has staff members with occupational exposures or potential exposures to bloodborne pathogens shall prepare a written exposure determination. This exposure determination shall be reviewed at least annually by the assigned Safety and Health Representative or designee and shall contain the following:
 - 7.1.1.1.1 List of all job classifications (projects) to which all staff members in those job classifications have occupational exposure. Examples: physicians, nurses, medical technicians, and other specifically identified staff performing tasks involving resuscitation, intravenous therapy, injections, blood handling and/or analysis, and other potentially infectious materials.
 - 7.1.1.1.2 A list of job classifications (projects) to which some staff members have occupational exposure because of certain duties. Examples: first responders, first aid/CPR providers, emergency care providers, laboratory work or research with human fluids.

7.1.2 Physical Examinations

- 7.1.2.1 Pre-placement and yearly physical examinations are required for staff (those listed in Sections 7.1.2 and 7.1.3, above) whose work exposes them to HIV, HBV, and other blood borne pathogens. These examinations will provide the staff member with a physical assessment performed by a health medical facility or licensed healthcare professional approved by the BCD Medical Director and with an opportunity for counseling on worker health concerns.

7.1.3 Sharps Injury Logs

- 7.1.3.1 Line management shall verify that a sharps injury log has been established and is maintained for the recording of percutaneous injuries from contaminated sharps for affected projects. (Reference SHE GP-007)

- 7.1.3.2 The information from the sharps injury log shall be recorded and maintained in such a manner as to protect the confidentiality of the injured staff member. Refer to section 10.3.1.8 for the information to be included in the sharps injury log.

7.1.4 Precautions for Staff Members and Preventative Measures

- 7.1.4.1 All blood and other potentially infectious materials shall be considered infectious regardless of the source. Universal precautions shall be observed at B-site to prevent contact with blood and other potentially infectious materials.
- 7.1.4.2 Engineering and work practice controls shall be used to eliminate or minimize staff member exposure. Where occupational exposure remains after institution of these controls, personal protective equipment shall also be used.
- 7.1.4.3 Contaminated needles and other contaminated sharps shall not be bent, recapped, or removed. Shearing or breaking of contaminated needles is prohibited.
- 7.1.4.4 Immediately or as soon as possible after use, contaminated reusable sharps shall be placed in appropriate containers until properly processed. These containers shall be puncture resistant, leak proof on the sides and bottom, labeled in accordance with section 7.5.11 of this program, and designed so staff members are not required to reach by hand into these containers where sharps have been placed.
- 7.1.4.5 Certified biological safety cabinets (Class I, II, or III) or other appropriate combinations of personal protection or physical containment devices, such as special protective clothing, respirators, centrifuge safety cups, sealed centrifuge rotors, and containment bagging for animals, shall be used for all activities with other potentially infectious materials that pose a threat of exposure to droplets, splashes, spills, or aerosols.
- 7.1.4.6 All spills shall be immediately contained, posted, and cleaned up by appropriate professional staff or others who are properly trained and equipped.
- 7.1.4.7 Hand Washing Facilities
 - 7.1.4.7.1 Appropriate facilities for washing shall be made readily available to all staff working with blood or other potentially infectious materials. After removing gloves, staff will thoroughly wash hands and any other potentially contaminated skin immediately, or as soon as feasible, with soap and water.
- 7.1.4.8 Personal Protective Equipment
 - 7.1.4.8.1 BSH will provide personal protective equipment (PPE) for use by staff members at no cost to the staff member. (Refer to Personal Protective Equipment Program SHEP 023).
 - 7.1.4.8.2 Health Services and applicable BSH facilities will be evaluated by the appropriate Safety and Health Representative to identify the

potential for exposure and to determine appropriate engineering and work practice controls and PPE requirements. A purpose is protective clothing such as but not limited to gowns, aprons, lab coats, ethnic jackets, or similar outer garments shall be worn in occupational exposure situations. The type and characteristics will depend upon the task and degree of exposure anticipated.

7.1.4.8.3 Any PPE garment penetrated by blood shall be removed immediately or as soon as feasible and placed in an appropriately labeled (see section 7.1.4.11) designated container for storage, washing, decontamination, or disposal.

7.1.4.8.4 Gloves must be worn whenever it can reasonably be expected that staff members will have hand contact with blood or other potentially infectious materials, broken skin, or mucous membranes.

7.1.4.8.5 Disposable gloves shall not be washed or decontaminated for reuse. During use, the gloves must be replaced as soon as practical after they become contaminated, as soon as feasible after they are torn or punctured, or whenever their ability to function as a barrier has been compromised.

7.1.4.9 Handling Contaminated Laundry

7.1.4.9.1 Contaminated laundry shall be handled as little as possible with a minimum of agitation.

7.1.4.9.2 Contaminated laundry shall be bagged or contained at the location where it was used and shall not be stored or moved to the location of use.

7.1.4.9.3 Contaminated laundry shall be placed and transported in bags or containers labeled or color coded in accordance with section 7.9.10 of this program.

7.1.4.9.4 When a facility utilizes Universal Precautions in the handling of all soiled laundry, alternative labeling or color coding is sufficient if it permits all employees to recognize the containers as requiring compliance with Universal Precautions.

7.1.4.10 Handling Regulated Waste

7.1.4.10.1 Puncture resistant sharps containers shall be used for contaminated sharps capable of penetrating the skin, including but not limited to needles, scalpels, pipettes, broken glass, and capillary tubes. Sharps containers shall be easily accessible and as close as feasible to work areas.

7.1.4.10.2 Broken and bags or containers with broken or labels shall be used for disposal of regulated waste.

7.1.4.10.3 All regulated waste will be disposed of according to state and federal infectious waste regulations (Reference EP-PC 041-Contact

your Safety and Health Representative for disposal information and requirements.

7.1.4.11 Labeling

7.1.4.11.1 Labels shall include the following legend.



7.1.4.11.2 These labels shall be fluorescent orange or orange-red in predominantly so, with lettering and symbols in a contrasting color.

7.1.4.11.3 Labels shall be affixed as close as feasible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal.

7.1.4.11.4 Red bags or red containers may be substituted for labels.

7.1.4.12 Cleaning

7.1.4.12.1 All contaminated work surfaces will be decontaminated with an appropriate disinfectant solution such as diluted bleach, (10 percent volume/volume household bleach concentrations 5 parts water to 1 part bleach) after a procedure has been completed and immediately, or as soon as feasible, after spilling blood or any other potentially infectious materials. The disinfectant solution must have a minimum contact time of 30 minutes with the spilled blood. In addition, all work surfaces will be cleaned at the end of the work shift if they have become contaminated since the last cleaning.

Note: Bleach solutions prepared in house must have been made within 24 hours of use in order to be considered effective.

7.1.4.12.2 Broken gloves shall not be picked up by hand. For example, use a broom and dustpan and put the shards directly in a sharps container.

7.1.4.13 Hepatitis B Vaccine

7.1.4.13.1 All staff members identified as having the potential for exposure to blood or other potentially infectious materials will be offered the hepatitis B vaccine at no charge.

7.1.4.13.3 Staff members may be asked to undergo antibody testing to determine whether they have sufficient immunity without the vaccine.

7.1.4.13.3 Staff members are required to sign a Hepatitis B Vaccination Attendance/Consent/Refusal Form and submit the form to your Bloodborne Pathogens training instructor, the ESHA Q Systems Management and Training coordinator, if completing a self-study, or directly to BCO Health Services. Staff members who initially decline the vaccine but later wish to be vaccinated may do so at no charge.

7.1.4.13.4 Health Services or an approved medical facility shall administer all vaccinations.

8.0 MEDICAL MANAGEMENT POST EXPOSURE REVIEW

8.1.0 Post-Exposure Evaluation

- 8.1.0.1 Immediately report to Health Services or an approved medical facility for evaluation. Every exposure incident must be reported immediately to the Line Manager and the assigned Safety and Health Representative. When an exposure occurs while performing work in the field or off site, the following information shall be provided to the approved medical facility:
 - 8.1.0.2 A copy of CFR 1910.1030 with emphasis on paragraph (f).
 - 8.1.0.3 A description of the staff member's duties at the time of the incident.
 - 8.1.0.4 How the exposure occurred and the route of entry (i.e., skin or mucous membrane).
 - 8.1.0.5 Health Services or the approved medical facility must obtain medical permission from the exposed staff member to draw blood for testing purposes (Hepatitis B Surface Antibody, Hepatitis C Antibody and HIV-1 Antibody).
 - 8.1.0.6 In the event of hepatitis B exposure to an individual not previously vaccinated against Hepatitis B, the hepatitis B vaccine (if not previously administered) and hepatitis B immune globulin should be offered and if consent given and administered within 24 hours and at most within 7 days of the exposure incident.
 - 8.1.0.7 At the discretion of Health Services or the approved medical facility, post exposure prophylaxis, as recommended by the U.S. Public Health Service will be provided. Counseling and evaluation of reported illness(es) will occur when medically indicated.
 - 8.1.0.8 Health services will try to identify the source individual (individual whose blood or other potentially infectious materials may be a source of occupational exposure to the staff member) and will attempt to ascertain his or her status. A medical evaluation will be conducted (Reference 29 CFR 1910.1030 60(f) Standard 6930).

81.6.9 The source individual will be requested to have a blood test. If the consent of the source individual is obtained, the sample will be tested for HIV and HBV infectivity. If consent is not obtained, this test shall be documented. When the source individual is known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.

81.6.10 Results of the source individual's testing shall be made available to the exposed staff member and the staff member shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

81.6.11 The line manager, or designee, shall complete an accident/incident investigation.

81.1 Post-Exposure Follow-up

81.1.1 Within 15 days of evaluation, the medical staff or other approved licensed healthcare professional will provide the exposed staff member with a written opinion of the staff member's status.

81.1.2 Counseling through the RSTI Employee Assistance Program will be made available to any individual who has had an exposure.

81.1.3 The staff member's supervisor shall complete an *Accident/Incident Analysis form* (Reference SOP CP 02) and forward it to the assigned Safety and Health Representative.

81.1.4 A complete review shall be made of the circumstances leading up to the exposure shall take place, including but not limited to the following:

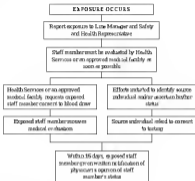
81.1.5 What the staff member was doing when the exposure occurred.

81.1.6 A review of the personal protective equipment worn during the incident and review of requirements, if indicated.

81.1.7 A review of training received by the exposed staff member and review of training if indicated by the review.

81.1.8 A review of existing procedures and controls.

81.1.9 Figure 1 presents a flow chart of the steps in post exposure evaluation and follow up.



9.0 TRAINING

9.0.1 Staff subject to potential exposure will be trained prior to their initial assignment and annually thereafter.

9.0.2 Training will include:

9.2.0.1 OSHA standard for bloodborne pathogens.

9.2.0.2 General epidemiology and symptomatology of bloodborne diseases.

9.2.0.3 Modes of transmission of bloodborne pathogens.

9.2.0.4 BSTD's Bloodborne Pathogen Program.

9.2.0.5 Project specific training shall include:

9.2.0.5.1 Tasks or activities that might cause exposure to blood or other potentially infectious materials.

9.2.0.5.2 Safe Work Place Work Instructions or procedures that include control methods such as the following: use of personal protective equipment, laboratory biohazard enclosures, signs and labels, etc.,

associated with specific tasks: decontamination and disposal techniques and accident responses.

§ 2.0.5.3 Post exposure evaluation and follow up.

§ 2.0.5.4 Hepatitis B vaccination program, and the opportunity to complete and hand in the Hepatitis B Vaccination Authorization/Declaration form.

Note: It is required that this form be completed and turned in to the instructor in order to receive a credit.

§ 2.0.5.5 A+ opportunity for questions and answers

§ 2.0.5.6 All training shall be documented including project-specific training.

10.0 RECORDS

10.1.0 Program Records

10.1.0.1 This program plan shall be reviewed at least annually and whenever necessary to reflect changes in regulation, new or modified tasks and procedures that affect occupational exposure. These reviews shall be documented and maintained in the Training and Quality Systems File. Program Review documentation shall include:

10.1.1 Changes in technologies that eliminate or reduce bloodborne pathogens

10.1.1.1 Consideration and implementation of appropriate commercially available and effective safer medical devices designed to eliminate or minimize occupational exposure.

10.1.1.2 Selection of report from non-managerial staff members who are potentially exposed to injuries from contaminated sharps in the identification, evaluation, and selection of effective engineering and work practice controls

10.1.2 Training records

10.1.2.1 All minimum training records shall include the following:

10.1.2.1.1 Dates of sessions.

10.1.2.1.2 Contents or summary of sessions.

10.1.2.1.3 Names, job titles, and payroll / badge numbers of all attendees.

10.1.2.1.4 Names and qualifications of persons conducting training

10.1.3 Medical Records

10.1.3.1 Medical files shall be maintained by BCO Health Services or an approved medical facility and shall include:

10.1.3.1.1 Staff member's name and social security number

10.1.3.1.2 A copy of staff member's hepatitis vaccination status.

10.1.3.1.3 Medical records relating to the staff member's ability to receive the vaccination.

- 10.1.3.5 A copy of all results of examinations, medical testing, and follow-up procedures.
- 10.1.3.6 Copies of the healthcare professional's written opinion as required in section 4.2.1 of this program.
- 10.1.3.7 Copy of any information provided to other healthcare professionals.
- 10.1.3.8 Sharps injury logs for percutaneous injuries from contaminated sharps that occur at King Avenue and West Jofferson locations are maintained by Health Services. All other regional offices and field operations location managers or designees are responsible for ensuring that sharps injuries logs are maintained for injuries at those locations. Sharps injury logs at all locations shall contain the following information:
 - The type and brand of device involved in the incident.
 - The laboratory or work area where the exposure incident occurred.
 - An explanation of how the incident occurred.

10.1.4 Confidentiality/Strictly Private

- 10.1.4.1 Confidentiality/strictly private status of medical records is to be maintained. Written consent must be obtained from the staff member prior to the release of any medical records except those required by law (e.g. subpoenaed to court).

10.1.5 Maintenance of Records

- 10.1.5.1 BCO Health Services or an approved medical facility shall maintain medical records for at least the duration of employment plus 30 years.
- 10.1.5.2 The Sharps Injury Log shall be retained for a period of 5 years following the end of the year to which the log relates.

11.0 Related Documents

- SHEP 003 Accident and Incident Reporting and Investigation
- SHEP 36 Reporting and Recording Occupational Injuries and Illnesses
- BCO Operating Guide section 1340-4.1, Bloodborne Pathogens (1/2007)

Appendix A Sample Exposure Control Plan

1.0 Scope

This exposure control plan describes workplace controls and activities that help eliminate and minimize exposure to Bloodborne Pathogens.

2.0 Applicability

This exposure control plan applies to operations that may expose employees within the (enter department or project name) to Bloodborne Pathogens.

3.0 Background

(Discuss regulatory requirements and hazards of Bloodborne Pathogens potentially encountered in the work area)

4.0 Exposure Determinations

Personnel in the following job classifications perform work that has the potential for exposure to bloodborne pathogens:

Job Classification Example: Nurse	Task/Procedure that has BBP exposure potential Example: A disinfecting surface clean Tech

5.0 Methods of Compliance

(This section is used to describe work practices, equipment, and PPE used to control bloodborne pathogen exposures specific to the department or operation)

5.1 Universal Precautions

Universal precautions are an approach to infection control. According to this concept all human blood and other potentially infectious materials are treated as if known to be infectious.

5.2 Engineering Controls

(For each section below enter any department specific tools and procedures)

- 5.2.1 Needles
- 5.2.2 Reusable Sharps
- 5.2.3 Sharps Containers

5.3 Work Practice Controls

(Describe departmental or operation specific procedures for items listed below as applicable and add items where necessary)

- 5.3.1 Personal Protective Equipment

- 5.3.2 Handling Specimens
- 5.3.3 Handling Sharps
- 5.3.4 Handling Contaminated Equipment
- 5.3.5 Clean up Procedures
- 5.3.6 Laundry Procedures

5.4 Infectious Waste Management

(Describe procedures for disposal and treatment of infectious waste as applicable to your department)

6.0 Hepatitis B Vaccinations

7.0 Exposure Procedures

(Describe procedures to be taken in the event of an exposure incident. These procedures should be department/operation specific)

8.0 Evaluation of This Plan

(Discuss how and who will evaluate this plan on an annual basis)

9.0 Recordkeeping

(Discuss what records are maintained where and by whom. This discussion should be specific to department or operation, and should take privacy concerns into account)

Appendix B: Forms

Hepatitis B Vaccination Authorization/Declaration Intent Form (Mandatory)

Directions: Read and consider the following. Place a mark in the box next to the statement that applies to you, then sign and date this form. Return the form to your instructor who will then submit it to Health Services or submit the form with your self study packet so that the training coordinator may submit it to Health Services/self study courses may not be used as initial training or submit the form directly to JCC Health Services. You will not receive credit for Bloodborne Pathogens training unless this form has been completed and submitted.

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to me. However, I decline hepatitis B vaccination at this time. I understand that by declining the vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can reverse the vaccination decision at no charge to me.

I have already received the hepatitis B vaccination.

I want to receive the hepatitis B vaccination.

Printed Name _____
(bold as above)

Signature _____
(bold as above)

Date _____

Printed Name _____
(bold as above)

Signature _____
(bold as above)

Date _____

Battelle Science & Technology International**Safety and Industrial Hygiene
General Procedure**

Title	Respiratory Protection Procedure
Number	SSTI-GP-010
Revision	0

Composed By


Fadden Kight

SSTI Safety Advisor

10-13-04
Date

Reviewed By


Curt Frenning
SSTI, Manager, Quality Management
System and Training10/18/04
Date

Approved By


Donald W. Cagle
SSTI, Manager, Safety, Health and
Emergency Response10/15/04
Date

Approved By


Mark Jackson
SSTI, Manager, Regulatory Compliance10/13/04
Date

Approved By


N. Joseph Ginn
Vice President, SSTI Environmental, Safety,
Health, and Quality10/23/04
Date

TABLE OF CONTENTS

1.0	PURPOSE	1
1.0	SCOPE AND APPLICABILITY	1
1.0	PREREQUISITES	1
2.0	TERMINOLOGY	1
3.0	DEFINITIONS	3
4.0	REGULATORY/CONSULTANT STANDARDS/REFERENCES	4
5.0	RESPONSIBILITIES	4
6.0	PROCEDURE	6
7.0	RECORDS	11
8.0	RELATED DOCUMENTS	11
APPENDIX A	RESPIRATOR CARTRIDGE SERVICE LIFE DETERMINATION	12
	Minimum and Maximum Allowable Cartridge Life and Warning Cartridge Change Life	12
	Maximum and Minimum Recommended Cartridge Service Life	12
	Respirator Training History	12

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	11/24/20	Replace EICU PP 000 - Review due to decertification Fire Organization

1.0 PURPOSE

The purpose of this procedure is to provide guidance for assessment of work areas, to establish personnel responsibilities, to assure proper selection, usage, and maintenance of respiratory protection equipment, and to establish a mechanism for the documentation of these activities in accordance with applicable regulatory requirements and accepted work practices.

2.0 SCOPE AND APPLICABILITY

This procedure applies to Battelle Science and Technology International (BSTI) including regional offices and field operations.

3.0 PREREQUISITES

3.1 Training

- 3.1.1 For the safe and effective use of respiratory protection equipment, it is essential that the user be properly instructed in its purpose, selection, use, and maintenance. Training must be provided by a qualified individual. Prior to being assigned a respirator, every respirator user must receive appropriate training in the following areas:
 - 3.1.2 Requirements of the respirator procedure, including responsibilities of associated personnel.
 - 3.1.3 Nature of the hazard(s).
 - 3.1.4 Exposure control methods.
 - 3.1.5 Suitability, capabilities, and limitations of the particular respirator to be used.
 - 3.1.6 Recognizing and handling emergencies as appropriate.
 - 3.1.7 How to don and doff respiratory protection equipment properly, including positive and negative pressure user seal checks.
 - 3.1.8 Requirements for inspection, storage, maintenance, and cleaning of the respirator.
 - 3.1.9 Respirator cartridge replacement frequency.
 - 3.1.10 The user must demonstrate competency by passing the given test with a score of 80% or greater.
 - 3.1.11 Refresher training will be given annually. Retraining also is required when a periodic inspection reveals inadequacies in the staff member's knowledge or use of the procedure.
 - 3.1.12 Authorization to use respiratory protection equipment will be revoked by the Safety and Health Representative or designee if refresher training is not satisfactorily completed.

3.2 Medical Evaluation

- 3.2.1 Medical approval is required for those who need to wear respiratory protection equipment. Staff will not be permitted to wear respirators in BSTI operations without a current medical statement approving such use.

3.2.2 A Medical Evaluator will determine an individual's physical fitness for respirator use. The intervals for examinations are established by BSI Health Services. Regardless of the frequency of examination, Health Services (or appropriate medical personnel) staff will evaluate staff files prior to annual refitting. Depending upon the medical condition of the individual, the Medical Evaluator shall determine the extent of medical testing necessary to approve continued respirator usage.

3.2.3 The Medical Evaluator will do one of the following:

- 3.2.3.1 Approve the individual for unrestricted use.
- 3.2.3.2 Approve the individual for restricted use and describe the restriction(s).
- 3.2.3.3 Deny use of a respirator to the individual.

3.3 Fit Testing

3.3.1 The following requirements must be met prior to a staff member being fitted for respiratory protection: (1) medical approval and (2) training completed.

3.3.2 Fit testing is performed by an authorized individual in accordance with the applicable approved quantitative or qualitative fit test protocol. This individual is appointed by the BSI Safety, Health and Emergency Response Manager.

3.3.3 Each different type of respiratory protection equipment that uses a facepiece to face seal shall be fit tested. This includes self-contained breathing apparatus (SCBA) masks, air line regulator masks, filtering facepiece (dust masks) and powered or nonpowered air purifying respirators (APRs). Positive pressure facepieces will be tested in the negative pressure mode.

3.3.4 For APRs, a sufficient number of styles and sizes will be made available. The staff member will be allowed to examine each of the respirators available and choose one for further fit test.

3.3.5 Fit testing will be performed at least annually for staff who remain active in the Respiratory Protection Procedure. Fit testing also will be repeated as necessary for staff that could affect the fit (e.g., excessive weight loss or gain, dentures, and scars).

4.0 DEFINITIONS

4.1 The following definitions apply only to this procedure:

Exposure Limit— Permissible exposure limit (PEL) as defined by the Occupational Safety and Health Administration (OSHA) as an employee's exposure to any substance listed in Tables Z-1, Z-2 and Z-3 in any 8 hour work shift of a 40 hour work week, which shall not exceed the 8-hour time-weighted average limit given for that substance in the table. Exposure limits also may be expressed in terms of ceiling concentrations. The American Conference of Governmental Industrial Hygienists establishes recommended exposure limits referred to as "threshold limit values." The National Institute for Occupational Safety and Health (NIOSH) also establishes "recommended exposure limits."

Immediately Dangerous to Life or Health (IDLH)— A n atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere. (Also see 29 Code of Federal Regulations (CFR) 1910.134(g)(34)

Oxygen Deficient Atmosphere— Oxygen deficient atmosphere means an atmosphere with oxygen content below 19.5% by volume.

Protection Factor (PF)— The number assigned to indicate the capability of a respirator to afford a certain degree of protection in terms of fit and filter/clearance penetrations. (Various agencies may assign PFs.)

Qualitative Fit Test - (QFLT) — A measurement of the adequacy of respirator fit by determining whether or not an individual using the respirator can detect the odor, taste, or irritation of a contaminant introduced into the vicinity of the user's head.

Quantitative Fit Test - (QNFT) — A measurement of the adequacy of respirator fit by numerically measuring concentrations of a challenge agent inside and outside the face piece. The ratio of the two measurements is an index of leakage at the seal between the respirator face piece and the user's face.

Respirator— Respiratory Protection Equipment— Any device certified by NIOSH and the Mine Safety and Health Administration that is designed to protect the user from inhalation of harmful contaminants. Disposable filtering facepiece and air-purified suits (bubble suits, not those that are incidentally pressurized when worn over an air supplying respirator) are specifically included even when used for non-toxic, non-irritant contaminants. Excluded are SCUBA and surgical masks. (Note: Surgical masks cannot be used as a substitute where respiratory protection is needed.)

4.2 The following definitions can be found in the BSI Glossary:

- | | |
|---------------------------|------------------------|
| • Administrative Controls | • Qualified Individual |
| • Authorized Technicians | • Qualified User |
| • Engineering Controls | |

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- 5.1 OSHA 29 CFR Section 1910.134 "Respiratory Protection."
- 5.2 Nuclear Regulatory Commission 10 CFR Part 20 "Standards for Protection against Radiation."
- 5.3 NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84
- 5.4 NIOSH Guide to Industrial Respiratory Protection.
- 5.5 The Occupational Environment—Its Evaluation, Control, and Management Chapter 36 American Industrial Hygiene Association
- 5.6 Compressed Gas Association G-8.1, "Commodity Specifications for Air"

6.0 RESPONSIBILITIES

6.1 Time Management and Supervision

- 6.1.1 Ensure that the applicable Safety and Health Representative is informed of any planned use or expected need for respirators or a change in process or conditions that may lead to a need for respiratory protection.
- 6.1.2 Ensure that staff under their supervision are qualified and trained prior to using respirators.
- 6.1.3 Implement and apply this procedure in accordance with the information received from the Safety and Health Representative.

6.2 Safety and Health Representatives

- 6.2.1 Maintain detail and current knowledge of regulatory standards requirements, equipment capabilities and good practice affecting safe and effective use of respirators.
- 6.2.2 Evaluate implementation and effectiveness of the procedure and make recommendations based on those evaluations.
- 6.2.3 Evaluate staff exposures and work conditions including making inspections of respiratory protection equipment use.
- 6.2.4 Specify and document the appropriate respiratory protection and associated equipment (e.g. cartridges, sorbents and canisters) based on anticipated work conditions or activities.
- 6.2.5 Ensure in conjunction with management that staff are properly trained and fitted with the proper equipment when required to use respiratory protection equipment.
- 6.2.6 Verify that breathing air requirements for supplied air respirators are in accordance to OSHA 29 CFR 1910.134 (i).
- 6.2.7 Evaluate anticipated work conditions or activities to determine what respiratory protection is necessary.

6.3 Safety and Health Advisor

- 6.3.1. A designated respirator fit testing
- 6.3.2. Inspect and maintain SCBAs located in general areas of King Avenue and West Jefferson sites.
- 6.3.3. Maintain respirator fit testing equipment and ample supply of respiratory protection equipment.
- 6.3.4. Generate documentation of maintenance and inspection records of respiratory protection equipment and respirator fit testing

6.4 BCO Health Services

- 6.4.1. Determine medical fitness for respirator use.
- 6.4.2. Utilize the OSHA approved medical questionnaire (29 CFR 1910.134 Appendix C) or equivalent form.
- 6.4.3. Provide medical evaluations to appropriate Line Managers and Safety and Health Representatives.

6.5 Respirator Users

- 6.5.1. Use, maintain, inspect, and store respiratory protection equipment as instructed to meet the procedure requirements.
- 6.5.2. Inform BCO Health Services of any personal health problems that could be aggravated by the use of respiratory protection equipment.
- 6.5.3. Inform BCO Health Services of any changes in health or physical characteristics (e.g., excessive weight changes, dentures, deformities resulting from accidents, pregnancy, etc.) that could affect the use of a respirator.
- 6.5.4. Notify Safety and Health Representative of any changes in respiratory usage, working environment, process, regulations, and laboratory protocols, etc., so that the use of the respirator may be re-evaluated.
- 6.5.5. Provide input to Safety and Health Representatives, management, or others involved in the implementation of this procedure as to its effectiveness and identify problems associated with the implementation.

7.0 PROCEDURE

7.1 Hazard Control

Line Management and Safety and Health Representatives shall work to develop engineering and/or administrative controls to reduce the need for respiratory protective equipment.

7.2 Hazard Assessment

- 7.2.1. Each work place or work activity where BSW employees are exposed to hazardous conditions shall be evaluated by the appropriate Safety and Health Representative to determine the need for respiratory protection.

7.2.2 Identification of hazards should include – but is not limited to – consideration of the following items:

7.2.2.1 Airborne contaminants present

7.2.2.2 Engineering or administrative controls in place

7.2.2.3 Other potential hazards (e.g. oxygen deficient atmosphere, confined space)

7.2.3 Hazard assessments shall be documented on Form SIH/PM 037 Personal Protective Equipment Hazard Assessment Certification.

7.3 Respirator Selection

7.3.1 The Safety and Health Representative or qualified designee shall become familiar with the types of respiratory protection available and their uses and limitations.

7.3.2 Respirators selected and used shall be NIOSH certified per 29 CFR 1910.134(d)(1)(ii). Selection shall be based on a level of protection equal to or greater than the minimum required to protect the exposed employee(s) from the potential or observed hazards. Selection criteria that must be considered include the following:

7.3.2.1 Emergency situations

7.3.2.2 Presence of carcinogens

7.3.2.3 Contaminant concentration greater than the exposure limit

7.3.2.4 Contaminant concentration greater than the IDLH level

7.3.2.5 Oxygen deficient atmosphere <19.5% oxygen by volume (also IDLH)

7.3.2.6 Protection Factors

7.3.2.7 Adequate warning properties – taste, odor, irritation

7.3.2.8 Physical state of contaminant (gas/vapor or particulate)

7.3.2.9 Adverse health effects (in the event of breakthrough or leakage)

7.3.2.10 Amount of time respirator will be worn

7.3.2.11 Work restrictions/fitness (physical activity, temperature/humidity)

7.3.2.12 Fit test results (a different respirator must be selected if the one originally selected cannot be fit).

7.4 Maintenance, Inspection, and Care of Respirators

7.4.1 Any supplementary standard operating procedures, SOPs or protocols governing respirator use will include instructions for the maintenance and care of respirators. The SOP or protocol cannot be less restrictive than this procedure. Regular inspections shall be conducted by a qualified individual to assure respirators are properly used, cleaned, and stored. Items important to maintenance care, use and inspection include the following:

- 7.4.1.1 Inspection for defects (facepiece condition, headband, valves, and cartridges)
- 7.4.1.2 Cleaning, disinfecting, and decontaminating before and after use
- 7.4.1.3 Proper storage
- 7.4.1.4 Store to protect from damage, contamination that might alter temperature, excessive moisture, and to prevent deformation of facepiece and exhalation valves.
- 7.4.2 Only an authorized individual, appointed by the BSH Safety Health and Emergency Response Manager, shall make repairs and replace parts, using parts designed for the respirator and authorized for use by the manufacturer. Users will make no repairs or modifications to any component, unless specifically instructed to do so by a qualified individual.
- 7.4.3 The user is responsible for maintaining a good facepiece seal in accordance with instructions received during training and fit testing. Respirators that depend on a facepiece seal will not be worn when conditions such as the following prevent an effective facepiece seal:
 - 7.4.3.1 Facial hair in the seal area
 - 7.4.3.2 Eyeglass temples extending through the seal area
 - 7.4.3.3 Shape of the face, facial features or scars, dentures or other conditions that would preclude an accurate measurement of respirator fit
 - 7.4.3.4 Protective clothing in the seal area.
- 7.4.4 The Supervisor, in conjunction with the Safety and Health Representative, is responsible for determining a respirator replacement schedule for respirator cartridges and shall perform periodic inspections to verify that cartridges are being replaced according to this schedule.
- 7.4.5 Information concerning respirator cartridge replacement information may be found in Appendix A. The useful life of cartridges varies, under user conditions. Conditions of use include, but are not limited to: length of time the respirator is worn, ambient temperature, nature of use, humidity in area of use, and anticipated air volume based on the physical exertion of the user. Once this information is determined, the user shall be placed on a schedule to replace the cartridge at 80% of the maximum life expectancy for the selected cartridge. At a maximum, cartridges will be replaced:
 - 7.4.5.1 If the projected 80% maximum use limitation is exceeded
 - 7.4.5.2 If breakthrough is detected
 - 7.4.5.3 When the end-of-service life indicator shows the cartridge is expired or spent
 - 7.4.5.4 When instructed based on exposure potential
 - 7.4.5.5 When there is noticeably increased breathing resistance, or

7.4.5.6 If the cartridges have become damaged.

7.5 Voluntary Use

- 7.5.1 Voluntary use of an AFR is permissible if the individual's Safety and Health Representative approves the use in writing (Form SIH-FM-002, Voluntary Respirator Use). Voluntary use is not allowed for any other type of respiratory protection (i.e., supplied air respirators) nor is it allowed if the AFR, in itself, is determined to create a hazard.
- 7.5.2 Voluntary use is allowed only where the use is requested for comfort reasons by the employee from the Safety and Health Representative, who will determine the appropriateness of using an AFR. It will not be approved for exposure to toxic substances.
- 7.5.3 When approved, BSH will provide the appropriate NIOSH-approved AFR to be used. Employees will be informed that the AFR is to be used only for the purposes for which it was issued and that they are to discontinue use of the AFR if they experience any adverse health effects or difficulty breathing while wearing the AFR. If this occurs, they must report to BSH Health Services immediately.
- 7.5.4 The Safety and Health Representative will ensure that the employee requesting an AFR under the voluntary use provision has received a medical clearance to wear the respirator. (A medical clearance is not needed for a filtering respirator.) The Safety and Health Representative will ensure that the employee reads and understands the instructions provided by the manufacturer on use and limitations of the respirator and indicates such by signature on form SIH-FM-002.

7.6 Use of Respiratory Protection by Non-Battelle Staff

- 7.6.1 OSHA (29 CFR 1910.134) requires that respirator users have been (1) medically evaluated to determine medical fitness for respirator use, (2) properly trained in use, care, and limitations, and (3) properly fit tested.
- 7.6.2 Normally, non-Battelle staff are expected to bring their own respirators obtained through their employer's respirator program.
- 7.6.3 If a non-Battelle staff member requires a respirator, one can be issued upon verification of his/her physician's approval, training, and fit test status.

7.7 Atmospheric-Supplying Respirators

7.7.1 SCBAs

- 7.7.1.1 SCBAs are available in areas where a need for such equipment has been recognized. The SCBA units are maintained and ready for emergency use. In addition, SCBAs may be rented or purchased for specific projects. A Safety and Health Representative must approve the purchase and use of any breathing air systems to ensure that they meet the requirements set forth in OSHA's and Battelle's Respiratory Protection Procedures.
- 7.7.1.2 Only individuals specifically trained to use SCBA equipment may do so.
- 7.7.1.3 Inspection and maintenance of those located in ground areas at King Avenue and West Jefferson are the responsibility of a Safety and Health Advisor. Those purchased for specific projects are the responsibility of the divisions to which they belong. Regional offices and field operations are responsible for inspection of their own SCBAs.
- 7.7.1.4 At a minimum, SCBAs must be inspected monthly and after each use. Annually, they must be flow-checked per manufacturer instructions by an authorized technician. Cylinders must be hydrostatically tested and regulators must be maintained per manufacturer instructions by an authorized technician.
- 7.7.1.5 SCBAs use a portable source of compressed air delivered through a high pressure hose from the cylinder to the respirator facepiece. Air supply for the cylinder is provided by an authorized vendor and must meet the requirements for Grade D or higher quality as set forth by Compressed Gas Association G 7.1, "Commodity Specification for Air." Documentation supporting this will be maintained.

7.7.2 Air-Line Respirators

- 7.7.2.1 Air-line respirators are available in areas where a need for such equipment has been recognized. The air-line respirator units are maintained and ready for emergency use. A Safety and Health Representative must approve the purchase and use of any breathing air systems to ensure that they meet the requirements set forth in OSHA's and Battelle's Respiratory Protection Procedures.
- 7.7.2.2 Only individuals specifically trained to use air-line respirators may do so.
- 7.7.2.3 Monthly inspections of those located in ground areas at King Avenue and West Jefferson are the responsibility of the air-line respirator user. Other inspections and maintenance required by manufacturer are required by the appropriate divisions. Regional offices and field operations are responsible for inspection of their own air-line respirators.

- 7.7.2.4 All air-line respirators must be inspected monthly and after each use. Annually, they must be flow checked per manufacturer instructions by an authorized technician. Cylinders must be hydrostatically tested and regulators must be maintained per manufacturer instructions by an authorized technician.
- 7.7.2.5 Air line respirators use a stationary source of compressed air delivered through a high pressure hose to the respirator facepiece. The air supply for air line respirators must meet the requirements for Grade D or higher quality as set forth by Compressed Gas Association G-7.1 "Commodity Specification for Air." Documentation supporting this will be maintained.
- 7.7.2.6 Breathing air compressors must be equipped with appropriate filtration and monitoring devices (e.g., carbon monoxide and temperature alarms).

7.8 Regional Offices and Field Operations

- 7.8.1 The Safety and Health Representative may delegate an authorized individual to conduct fit tests and manage other aspects of this procedure. The Safety and Health Representative will directly evaluate all off-site requests for performing fit tests and managing an off-site respiratory protection procedure. The Safety and Health Representative will verify and document the qualifications of an individual or individuals to conduct fit tests and to assume any other respiratory protection procedure responsibilities.
- 7.8.2 The Safety and Health Representative will inspect the procedure annually to ensure its effective functioning. The responsibilities of the regional offices and field operations Representatives will be reevaluated annually by the Safety and Health Representative. Their authority to conduct fit tests and/or manage the respiratory protection procedure may be revoked when deemed necessary by the responsible Safety and Health Representative.

10 RECORDS

Name of Records	Record Media	Location	Retention Period
Respiratory Protection Training	Paper	ESH&Q Control Files	Permanent
Medical Evaluation	Paper	BCO Health Services	Permanent
Respirator Fit Test (<1 year)	Paper or Electronic	Safety, Health, and Emergency Response	Permanent
Respirator Fit Test (> 1 year)	Paper or Electronic	ESH&Q Control Files	Permanent
Respirator Assessments	Paper or Electronic	Business Groups	Permanent
Agreement for AFR Voluntary Use	Paper or Electronic	ESH&Q Control Files	Permanent
ESH 139 SCBA Inspection and Cylinder Maintenance	Paper or Electronic	ESH&Q Control Files	Permanent
Air Supply for Atmosphere-Supplying Respirators	Paper or Electronic	ESH&Q Control Files	Permanent
Respirator Cartridge Replacement Schedule	Paper or Electronic	Business Groups	Permanent
SH FM 627 Personal Protective Equipment Record Assessment Certificates	Paper or Electronic	ESH&Q Control Files	Permanent
SH FM 602 Voluntary Respirator Use	Paper or Electronic	ESH&Q Control Files	Permanent

11 RELATED DOCUMENTS

- ESH Operating Guide 1340 2.1, "Respiratory Protective Equipment"

APPENDIX A Respirator Cartridge Service Life Determination

Organic vapor cartridge life expectancy will vary based on ambient relative humidity, flow rate through the cartridge, temperature, and concentration of the contaminant that is being removed from the air stream. The National Institute for Occupational Safety and Health (NIOSH) tests organic cartridges for air purifying respirators. The NIOSH test protocol requires that the organic cartridge be subjected to a flow rate of 94 liter per minute (lpm) at existing room temperature and relative humidity. The protocol also tests the cartridge at 30 lpm and 25% and 85% relative humidity. Through each of these tests, the organic cartridge is subjected to 1,000 parts per million (ppm) carbon tetrachloride and must withstand the concentration for 50 minutes with less than 5 ppm penetration. NIOSH does not test cartridges under varying conditions of use.

Methods for Determining Useful Cartridge Life for Varying Conditions of Use

This is a compilation of methods for determining the useful life of organic cartridge respirators. Select a method that is conservative, reproducible, and suitable for the needs of the workers. Use available manufacturer's information concerning service life for variable conditions.

Manufacturer's Suggested Respirator Change Schedule

Cartridge life extension is available through some manufacturer Web pages. Use the following Internet addresses to find information for some manufacturers:

- 3M — www.3m.com/quality — Then click on Establishing a Chemical Cartridge Change Schedule
- MSA — www.msa.com/usa/products/canisters/index.html
- Others — Check the Web page of your particular manufacturer.
- OSHA — http://www.osha-slc.gov/SLC/respiratory_adminmain06_modeltypes_andtest_methods/for-cartridge_data-descriptions_data.html or http://www.osha-slc.gov/SLC/respiratory_adminmainpage.html

Rule of Thumb Method

In Chapter 38 of the AHA publication *The Occupational Environment—An Illustration Control and Management*, a "rule of thumb" is presented for estimating organic vapor cartridge service life. The suggested rule of thumb is as follows:

- If the chemical's boiling point is > 70° C and the concentration is less than 200 ppm, the expected service life is 8 hours at a normal work rate.
- Service life is inversely proportional to work rate.
- Reducing concentrations by a factor of 10 will increase service life by a factor of 5.
- Humidity above 85% will reduce service life by 50%.

Battelle Science & Technology International Safety, Health And Emergency Response

Title	Reporting And Recording Occupational Injuries And Illnesses
Number	STH-GP-020
Revisions	00

Originator



Eric J. Groffman

April 28, 2004

Date

Adviser: Safety Health And Emergency Response

Approved By


Donald W. Cagle
Manager, Safety, Health And Emergency
Response and Support for Chairpersons of the
BSTI Safety Committee

4/28/04

Date

Approved By


Mark D. Jackson

5/3/04

Date

Manager, Regulatory Compliance

Approved By


N. Joseph Gaudin
Vice President, BSTI Environment, Safety,
Health and Quality Systems Management

5/5/04

Date

TABLE OF CONTENTS

1.0 PURPOSE	3
2.0 SCOPE AND APPLICABILITY	3
3.0 PREREQUISITES	3
4.0 DEFINITIONS	3
5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES	5
6.0 RESPONSIBILITIES	5
6.1 Highest Ranking Official at each BSTI Regional Office	5
6.2 Manager of Safety, Health, and Emergency Response or Designate	6
6.3 BSTI Safety and Health Representative(s)	6
6.4 BSTI Safety Health and Emergency Response Advisors	6
6.5 Designated OSHA recordkeeping personnel	6
6.6 Manager's supervisor	7
6.7 Staff Members	7
7.0 PROCEDURE	8
7.1 Reporting Injuries and Illnesses	8
7.2 Reporting Fatalities and Multiple Hospitalizations to OSHA	8
7.3 OSHA Work-related Injury and Illness Recordkeeping Requirements	9
7.4 Certification, Posting, and Distribution of the Summary of Work-related Injuries and Illnesses (OSHA Form 300A)	10
7.5 Access Retention and Updating of OSHA Forms	10
7.6 Program Maintenance	11
8.0 Records	11
9.0 Related Documents	11
APPENDIX A OSHA Form 301 Injury and Illness Incident Report	12
APPENDIX B OSHA Form 303 Log of Work-Related Injuries and Illnesses	13
APPENDIX C OSHA Form 300A Summary of Work-Related Injuries and Illnesses	14
APPENDIX D Calculating Injury and Illness Incidence Rates	15
APPENDIX E Fatality Reporting Matrix	16
APPENDIX F Decision Worksheet for Recording Work-Related Injuries and Illnesses	18
APPENDIX G Record Keeping Flow Chart	19

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	09/1/04	Initial Release

1.0 PURPOSE

- 1.0.1 The purpose of this program is to describe responsibilities and methods for documenting work-related injuries and illnesses to Battelle Science and Technology International (BSTI) management and designated Occupational Safety and Health Administration (OSHA) recordkeeping personnel, for reporting fatalities and multiple hospitalizations to the OSHA Area Office or State OSHA office, and for recording work-related injuries and illnesses at BSTI regional offices.

2.0 SCOPE AND APPLICABILITY

- 2.0.1 This program applies to staff members of BSTI (including its regional offices) who sustain work-related injuries or illnesses. Staff members include full-time, part-time, and contractor employees (such as contractors from a temporary labor service) if BSTI staff provide day-to-day supervision to the contractor employees. Injuries and illnesses to contractor employees who work under the day-to-day supervision of the contractor are not within the scope of this procedure. These shall be reported to and consequently recorded by the contractor.
- 2.0.2 This program does not describe requirements for investigation of accidents (See SHE GP 001).
- 2.0.3 BSTI is considered a partially exempt industry under Section 1904.3 of 29 CFR based on its Standard Industrial Classification (SIC) of 8731 Engineering, Consulting, Research, Management and Related Services. A partially exempt industry is not required to keep OSHA injury and illness records unless asked in writing to do so by OSHA, the Bureau of Labor Statistics (BLS), or a state agency operating under the authority of OSHA or the BLS. Not only in maintaining this information a good management practice, BSTI routinely receives mandatory surveys from the BLS and requests for this information in client Requests for Proposals (RFP). Therefore, BSTI needs to maintain injury and illness records in conformance with OSHA regulations and this program. All Battelle-owned and operated facilities and BSTI regional locations (leased or government-owned and operated) will maintain and report occupational injury and illness records. Additionally, BSTI is required by OSHA to report within eight (8) hours any workplace incident that results in a fatality or the hospitalization of three or more employees (a/ or to section 7.2).

3.0 PREREQUISITES

- 3.0.1 None

4.0 DEFINITIONS

Authorized Employee Representative An authorized collective bargaining agent of employees.

Bloodborne Pathogen Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Contaminated The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

Contaminated Sharps: A *sharp* contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, lancets, glass, broken capillary tubes, and exposed ends of dental wires.

Designated OSHA recordkeeping persons or: Persons designated by the highest ranking official at the regional office to evaluate work-related injuries and illnesses for recordability, to return and update OSHA records, and to complete and post the required reports.

Establishment: A single physical location where business is conducted or where services or industrial operations are performed. One business location has only one establishment. BOSTI King Avenue, BOSTI West Jefferson, and individual BOSTI regional offices and field locations are required to establish and maintain separate reporting and recording requirements.

Highest Ranking Official: The most senior person with managerial responsibilities at each regional office location.

Medical Treatment: The management and care of a patient to combat a disease or disorder. Medical treatment does not include:

- Visits to a physician or other licensed health care professional solely for observation and counseling.
- The conduct of diagnostic procedures, such as X-rays and blood tests, including the administration of preoperative medications used solely for diagnostic purposes.
- First Aid (See 29 CFR, Section 1904.7(h)(5)(ii)) for a complete list of all treatments considered first aid).

OSHA Form 300, Log of Work-Related Injuries and Illnesses: The OSHA recordkeeping form used to list recordable work-related injuries and illnesses of all BOSTI employees whether they are executive, labor, hourly, salary, part time, seasonal or migrant workers at each separate establishment. Work-related injuries or illnesses to employees from a temporary help service, employee leasing service, or personnel supply service must be reported by BOSTI if BOSTI staff supervise these employees on a day-to-day basis.

OSHA Form 300A, Summary of Work-Related Injuries and Illnesses: This form, completed annually (each calendar year), provides a summary of injuries and illnesses recorded on OSHA Form 300. Each establishment is required to post a copy of the form in a conspicuous place where notices to employees are customarily posted. The form must be posted no later than February 1 of the year following the year covered by the records and must remain posted until April 30.

OSHA Form 301, Injury and Illness Incident Report: The form prepared for each recordable work-related injury or illness that contains the detailed information necessary to enter on OSHA Form 300.

Other Potentially Infectious Materials: (1) The following human body fluids, tissues, vapors, secretions, excretions, genital fluid, synovial fluid, pleural fluid, pericardial

fluid processed fluid, anatomic fluid, excreta in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids, (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and (3) HIV containing cell or tissue cultures, organ cultures, and HIV, HBV, or other infectious substance containing culture mediums or other solutions, and blood, organs, or other tissues from experimental animals infected with HIV, HBV, or other substance infectious to humans.

Potential Concern Case – A predetermined work-related injury or illness to an employee whose name cannot be entered on the OSHA 300 Log due to the sensitive nature of the injury or illness.

Personal Employee Representative – Any person that the employee or former employee designates, as such, in writing as the legal representative of a deceased or legally incapacitated employee or former employee.

Recordable Injury or Illness – A work-related injury or illness that meets the general recording criteria listed in 29 CFR 1904.7 and 1904.8 – 1904.12 (5 or section 7.6)

Regional Office – All offices that are organized under Battelle Science and Technology International (e.g., King Avenue, WestJettersen, Oakbury, Dayton).

Standard Threshold Shift – A change in hearing threshold, relative to the baseline audiogram for that employee, of an average of 10 decibels (dB) or more at 2000, 3000, and 4000 hertz (Hz) in one or both ears.

Work Environment – Includes the establishment and other work locations where one or more employees are working or are present as a condition of their employment.

Work-Related Injury or Illness – An event or exposure in the work environment causing or contributing to the condition or the significant aggravation of a preexisting condition. Work-relatedness is presumed for injuries or illnesses resulting from events in the workplace, unless an exception specifically applies. (Refer to Appendix E Health Services OSHA Recordkeeping Procedures and 29 CFR 1904.5(b)(2)).

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- 29 CFR Part 1904, Recording and Reporting Occupational Injuries and Illnesses
- 29 CFR Part 1910.1030, Bloodborne Pathogens

6.0 RESPONSIBILITIES

6.1 Highest Ranking Official at each BSI/Regional Office

- 6.1.1 Ensure that regional office staff members have a method to report injuries and illnesses and ensure emergency assistance to each regional office.
- 6.1.2 Appoint designated OSHA recordkeeping personnel and make available resources necessary to accomplish the requirements of this program.

- 4.2.3 Review and sign the Summary of Work Related Injuries and Illnesses (OSHA Form 300A) to certify that he or she has reviewed the Log of Work Related Injuries and Illnesses (OSHA Form 300) and that he or she reasonably believes, based on his or her knowledge of the process by which the information was recorded, that the Summary of Work Related Injuries and Illnesses is correct and complete.

4.2 Manager of Safety, Health, and Emergency Response or Designate

- 4.2.1 Interface with regulators in reporting of fatalities and multiple hospitalizations.
- 4.2.2 Verify that processes for reporting injuries and illnesses have been established for affected regional offices.
- 4.2.3 Periodically assess the adequacy, suitability and effectiveness of this program.

6.3 BSTI Safety and Health Representatives

- 4.3.1 Immediately notify the Manager of Safety, Health, and Emergency Response of any work related fatality or multiple hospitalizations using the Reporting of Fatalities and Multiple Hospitalizations to OSHA Area Offices form (included as Appendix F) to ensure the complete transfer of required information.
- 4.3.2 Coordinate with and assist regional offices in developing effective OSHA recordkeeping systems.
- 4.3.3 At the end of each calendar year and prior to posting, verify that the OSHA Summary of Work Related Injuries and Illnesses has been completed, perform a review of the Summary of Work Related Injuries and Illnesses, and return any corrections or comments to the designated OSHA recordkeeping personnel.
- 4.3.4 Verify that the certified annual summary for the King Airbase location has been posted by February 1st of each year.

6.4 BSTI Safety Health, and Emergency Response Advisors

- 4.4.1 Provide assistance to designated OSHA recordkeeping personnel and Safety and Health Representatives in the development and review of recordkeeping systems.
- 4.4.2 Compile and maintain central file copies of the Log of Work Related Injuries and Illnesses, Injury and Illness Incident Report and Summary of Work Related Injuries and Illnesses (OSHA Forms 300, 301, and 300A, respectively).
- 4.4.3 Compile annual incidence rates in accordance with the standard calculations shown in Appendix E.

6.5 Designated OSHA recordkeeping personnel

Note: Health Services staff are the designated OSHA recordkeeping personnel for the King Airbase and West Jefferson locations.

- 4.5.1 Immediately notify the Manager of BSI Safety Health and Emergency Response of any work related fatality or multiple hospitalizations using the Reporting of Fatalities and Multiple Hospitalizations to OSHA Area Offices form (Appendix E) to ensure the complete transfer of required information.

- 6.5.3 Notify the appropriate Safety and Health Representative and the employee's immediate supervisor of any known or suspected OSHA recordable case as soon as possible so that an accident/incident investigation (See Accident/Incident Reporting and Investigation Program SHE GP 001) can be initiated.
- 6.5.3 Communicate with BCO Medical Director, Safety and Health Representative, BSTI managers and supervisors, the injured staff member and the Workers' Compensation Administrator's office concerning medical case dispositions, lost workdays, lost time, and restricted work activity.
- 6.5.4 Acquire information from on site and off-site examining physicians concerning prognosis, restriction, and return to work dates, and stipulations, future treatment, days away from work, or need for permanent job transfer.
- 6.5.5 Complete and update (during their 5 year retention periods) the Log of Work Related Injuries and Illnesses and Injury and Illness Incident Report (OSHA Form 300 and 301).
- 6.5.6 Provide the completed Summary of Work Related Injuries and Illnesses to the Safety and Health Representative by the 1st week of January for review.
- 6.5.7 Incorporate comments, as necessary, resulting from the Safety and Health Representative's review and provide the Summary of Work Related Injuries and Illnesses and the Log of Work Related Injuries and Illnesses to the highest ranking official of the BSTI regional office for review and certification by the 3rd week of January.
- 6.5.8 By February 1st of each year appropriately post the Summary of Work Related Injuries and Illnesses and provide a copy of the certified Summary of Work Related Injuries and Illnesses and related Log of Work Related Injuries and Illnesses to BSTI Safety, Health and Emergency Response.

Note: The Safety and Health Representatives at their campuses are required to post the certified summary at the KingAvenue Campus.

6.6 Managers/Supervisors

- 6.6.1 Immediately notify the Safety and Health Representative of any work related fatality or multiple hospitalizations using the Reporting of Fatalities and Multiple Hospitalizations to OSHA Area Offices form (A, appendix B) to ensure the complete transfer of required information.
- 6.6.2 Ensure that staff members report injuries and illnesses.
- 6.6.3 Initiate and complete an Accident/Incident Investigation form for recordable injuries and illnesses, (see section 7.5) as required by The Accident/Incident Investigation Program Conference SHE GP 001 and forward the form to the appropriate Safety and Health Representative.

6.7 Staff Members

- 6.7.1 Follow the established regional office emergency plan to ensure emergency assistance.

Note: For the Columbus-King Avenue and West Jefferson regional offices, emergency assistance may be acquired by calling 911 from an internal line before, during, and after hours. Calls made from external lines such as cell phones should use (614) 424-4444.

6.7.3 Notify your assigned BSTI Safety and Health Representative / see <http://www.osha-slc.org/bsctcp/bsctcporg/mstc.htm/>

6.7.3 Report injuries and illnesses to the regional office designated OSHA recordkeeping personnel and to your immediate supervisor as soon as practical

7.0 PROCEDURE

7.1 Reporting Injuries and Illnesses

7.1.1 What to Report - Report all work related injuries and illnesses regardless of how insignificant the injury/illness may seem. Examples of injury/illnesses that should be reported include but are not limited to the following: work related cuts, burns, falls, chemical exposures, noise hearing or vision problems, needlesticks, loss of consciousness, sprains/strains, fractures, and other/pains.

7.1.2 Where to report- Immediately seek medical attention if necessary using established methods for that regional office then report injuries and illnesses to Safety and Health Representatives as soon as practical (normally the next working day).

7.1.3 Who must report - All BSTI staff and contractor employees who receive day to-day supervision from BSTI staff must report injuries and illnesses to both their BSTI supervisor and to the Safety and Health Representatives.

Note: Columbus-King Avenue and West Jefferson regional office staff must report the injury or illness to both Health Services and their supervisor

7.2 Reporting Fatalities and Multiple Hospitalizations to OSHA

7.2.1 The Manager of Safety, Health, and Emergency Response or his/her designee must report to the OSHA area office or the State OSHA office (nearest the site of the incident) within eight (8) hours after the death of any BSTI employee from a work related incident (fatality) (including heart attacks that occurred at work) or the in-patient hospitalization of three or more employees as a result of a work related incident.

7.2.2 The incident must be reported orally by telephone or in person to the Federal OSHA Area Office or State OSHA office nearest to the site of the incident.

7.2.3 Reports by telephone must be made to a person, not to his/her voice mail. The Federal OSHA toll-free central telephone number (1-800-321-6742) may also be used.

7.2.4 Upon learning of a work related fatality or multiple hospitalizations use the form provided in Appendix P for guidance in transmitting required information to the Manager of Safety and Health or his/her designee.

7.2.5 Enclosure to OSHA Reporting Requirement

- Fatalities and multiple hospitalizations that occur as a result of a motor vehicle accident that occurred on a public street or highway, and not in a construction work zone, do not have to be reported to OSHA.
- Fatality and multiple hospitalizations incidents that occur on a commercial or public transportation system (commercial planes, train, subways or boats) do not have to be reported to OSHA.

7.3 OSHA Work-related Injury and Illness Recordkeeping Requirements

- 7.3.1 Each BSHI Regional Office with 50 employees or greater must establish an OSHA recordkeeping system to include maintenance of the Log of Work-Related Injuries and Illnesses, Injury and Illness Incident Reports, and Summary of Work-Related Injuries and Illnesses (OSHA Forms 300, 301, and 306A, respectively). Refer to Appendix G for a process description.
- 7.3.2 Each BSHI Regional Office with fewer than 50 employees must either establish an OSHA recordkeeping system as described above or must associate with a larger office in reporting and recording injuries and illnesses of its staff.
- 7.3.3 Each regional office must complete the Log of Work-Related Injuries and Illnesses and the Summary of Work-Related Injuries and Illnesses (OSHA Forms 300 and 306A) even if no recordable injuries or illnesses occurred during the year. Refer to Appendix F Decision Flow Chart for Recording Work-Related Injuries and Illnesses to help determine whether or not a case should be recorded on the Log of Work-Related Injuries and Illnesses.

Note: OSHA Forms are available from the OSHA website at <http://osha.gov/recordkeeping/OSHA-recordkeepingforms.cfm>, and may be acquired via the appropriate Safety and Health Representatives. Examples of the OSHA recordkeeping forms are also included in Appendices B, C, and D).

7.3.4 Work-related injuries and illnesses are recordable if they fall into either of the following two categories (shown below with examples).

Category	General Recording Criteria	Specific Cases
Examples:	Death	A. constant sharp or
	Medical treatment beyond first aid	needlestick injury
	Loss of consciousness	A. standard threshold shift or
	Restricted activity, job transfer or days away from work	change in hearing threshold
	A. significant diagnosis	see definition
		Medical removal as reported by an OSHA standard
		Occupational exposure to a known case of tuberculosis

Note: Refer to Appendix F for the Decision Flowchart for Recording Work-Related Injuries and Illnesses.

- 7.3.5 The regional office designated OSHA recordkeeping personnel after consultation with their assigned Safety and Health Representatives must enter recordable injuries and illnesses on the Log of Work-Related Injuries and Illnesses (OSHA Form 300).

and the Injury and Illness Incident Report (OSHA Form 300) within 7 days of receipt of information that a recordable injury or illness has occurred.

Note: Refer to Appendix C for the Flowchart of Work-Related Injury and Illness Recordkeeping Process

7.3.6 The designated OSHA recordkeeping personnel must enter the worker's privacy case on the Log of Work-Related Injuries and Illnesses (OSHA Form 300) as less of employee name for cases that meet the criteria of a "privacy concern case" as described below (and for other injuries and illnesses where the employee independently and voluntarily requests that his or her name not be entered on the log). A case is automatically considered a privacy concern case if it involved one or more of the following:

- An injury or illness to an intimate body part or the reproductive system
- An injury or illness resulting from a sexual assault
- Mental illness
- HIV infection, hepatitis or tuberculosis
- Needle-stick injuries and cuts from sharp objects that are contaminated with another person's blood or other potentially infectious material. (refer to 29 CFR 1910.103 Bloodborne Pathogen Program and Appendix A for "other potentially infectious materials definition")
- Other injuries or illnesses if the employee independently and voluntarily requests that his or her name not be entered on the log

Note: Musculoskeletal disorders are not considered privacy case concerns.

7.3.7 A separate confidential list must be maintained by designated OSHA recordkeeping personnel that links privacy concern case numbers to employee names. This information must be made available to authorized government representatives.

7.4 Certification, Posting, and Distribution of the Summary of Work-Related Injuries and Illnesses (OSHA Form 300A)

7.4.1 By the 4th week of January of each year an officer or senior staff member at the (BCH) regional office must certify that the information contained in OSHA Form 300A is true, accurate, and complete by affixing his/her signature on the form.

7.4.2 Once signed, the designated OSHA recordkeeping personnel at each regional office must post on a conspicuous place or places where notices to employees are customarily posted, the Summary of Work-Related Injuries and Illnesses (OSHA Form 300A). The summary must be posted no later than February 1 of the following year and maintained in place until April 30.

WARNING: The Summary of Work-Related Injuries and Illnesses must not be removed, altered, defaced, or covered by any other material during the required posting duration.

7.5 Access, Submission, and Updating of OSHA Forms

7.5.1 Access to the Log of Work-Related Injuries and Illnesses (OSHA Form 300) may only be given to authorized government representatives, employees, former

employees' personal employee representatives or authorized employee representatives (refer to definitions section). Voluntary disclosure of the Log of Work-Related Injuries and Illnesses (OSHA Form 300) to any other person may occur only if the employee, names, and other personally identifying information have been removed (see 29CFR1904.28(b)(10) for exceptions).

7.5.3 Only the employee, former employee, or personal employee representative may be given access to the Injury and Illness Incident Report (OSHA Form 301) describing an injury or illness to that employee or former employee.

7.5.3 Personal employee representatives must present a signed release from the employee represented in order to obtain the Injury and Illness Incident Report (OSHA Form 301).

7.5.4 Legal representatives of incapacitated or deceased employees must present proof of representation when any OSHA records are requested.

7.5.5 A authorized employer representative may be given access only to the sections of the Injury and Illness Incident Report (OSHA Form 301) titled "Tell us about the case."

7.5.6 Access to the Summary of Work-Related Injuries and Illnesses (OSHA Form 300A) is not restricted.

7.6 Program Maintenance

7.6.1 This document is subject to a 3 year review cycle.

8.0 Records

8.0.1 The Summary of Work-Related Injuries and Illnesses, Log of Work-Related Injuries and Illnesses, and Injury and Illness Incident Reports must be retained for 5 years following the year covered by the forms.

8.0.2 The forms and supporting information are to be maintained by the designated recordkeeping personnel for each site required to maintain records.

8.0.3 During their 5 year retention period, the Log of Work-Related Injuries and Illnesses and Injury and Illness Incident Reports must be updated as new information becomes available regarding recorded cases. The Summary of Work-Related Injuries and Illnesses does not have to be updated.

8.0 Related Documents

- SIN CP 02 Accident and Incident Investigation Program
- SIN CP 07 Bloodborne Pathogens Program

APPENDIX D – Calculating Injury and Illness Incidence Rates

This guidance provides a standard method for calculating and reporting on an annual basis injury and illness rates.

The following information will be used for incidence rates calculations:

Averaging Annual Number of Staff

The average number of full time staff may be calculated by adding up monthly staff totals of the reporting location from the Battle Business Information system then dividing by 12.

$$(\text{Average \# of FTEs} = (\#FTE_{Jan} + \#FTE_{Feb} + \#FTE_{Mar} + \dots + \#FTE_{Dec}) / 12)$$

Estimating Full Time Staff Hours

The number of full time staff hours may be estimated by multiplying the average number of staff by 2080 (hours/week) per staff member per year).

$$(\text{FTE Hours} = \text{Average \# of FTEs} \times 2080)$$

Including Temporary Labor Hours

Acquire from the Purchasing Department the number of hours worked by temporary employees. Add the temporary labor hours to the Full time staff hours.

$$(\text{Total Staff Hours} = \text{FTE hours} + \text{Temporary Labor Hours})$$

Calculating the Total Recordable Incidence Rate (TRIR)¹

The TRIR is calculated by dividing total recordables by total staff hours then multiplying by 200,000. (Note: total of recordable injuries and illnesses is the sum of columns G, H (1 and 2) of the OSHA Form 300)

$$(\text{TRIR} = (\text{Total Recordables} / \text{Total Staff Hours}) \times 200,000)$$

Calculating incidence rates for recordable cases involving Days Away from work, days of Restricted work activity or job transfer (DART)²

The DART rate is calculated by dividing the sum of cases involving days away from work and days of restricted work activity or job transfer by total staff hours then multiplying by 200,000. (Note: total of cases resulting in days away, days of restriction or transfer is the sum of columns H and I of the OSHA Form 300)

$$(\text{DART} = (\text{Total DART cases} / \text{Total Staff Hours}) \times 200,000)$$

Calculating the Severity Rate³

¹ To calculate incidence rates for a Field or Battle Collection Operation, the numerator (e.g., total recordable cases and DART cases: no days away + days of job transfer + days of restricted work activity) must reflect the sum of all FICO reporting regional offices.

The severity rate is calculated by dividing the sum of days away from work, days of restriction and days of job transfer by total staff hours and then multiplying by 200,000. (Note: total days away = days of job transfer or restriction is the sum of columns E and L of the OSHA Form 300)

Severity Rate = (Total days away + days of job transfer + restriction / Total Staff Hours) x 200,000

APPENDIX E: Fatality Reporting Matrix

Reporting Fatalities and Multiple Hospitalization Incidents to OSHA Area Offices

A death of any employee or the in-patient hospitalization of three or more employees as a result of a work-related incident has occurred.

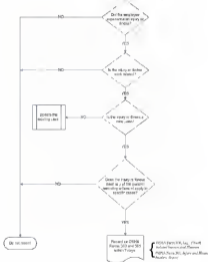
Immediately complete the form below and provide the information to the Manager of SHARP.

The Manager of SHARP must report, provide the following information to the Area OSHA office or State OSHA office within twenty-four (24) hours of the fatality or multiple hospitalization.

Required Information for Reporting an incident to OSHA

Establishment name	<i>This is the facility (i.e. the host incident)</i>
Location of the incident	<i>This is the facility (i.e. the host incident) that caused the fatality or the multiple hospitalization</i>
Date of the incident	<i>This is the date(s)</i>
Number of fatalities or hospitalized employees	<i>This is the number of fatalities and those requiring hospitalization</i>
The names of any injured employees	<i>This is the names of those injured (i.e. OSHA will be looking for a description)</i>
The contact person for the establishment and his or her phone number	<i>Provide the contact information</i>
A brief description of the event	<i>This is the 2 or 3 sentence description of what occurred as a result of the fatality or the multiple hospitalization</i>

APPENDIX F Decision Flowchart for Recording Work Related Injuries and Illnesses



Battelle Science & Technology International Safety, Health and Emergency Response General Procedure

Title	Accident/Incident Reporting and Investigation Procedure
Number	SHS-GR-024
Revision	0

Originator



Doug Wiersma

Representative, Safety, Health and Emergency Response

06/13/05

Date

Reviewed By



Michael Hill

Manager, Quality Systems Management and Training

6/27/05

Date

Approved By



Don Cagle

Manager, Safety, Health and Emergency Response

6/23/05

Date

Approved By



Mark Jackson

Manager, Regulatory Compliance Management

6/28/05

Date

Approved By

 J. Wright, MS, PSE

Jeffrey Wright, M.D., MPH

Medical Director of Battelle

7/6/05

Date

Approved By



Joe Gossion

Vice President, Environmental Safety, Health and Quality

8/3/05

Date

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	1
3.0	PREREQUISITES	1
4.0	DEFINITIONS	1
5.0	REGULATORY/VOLUNTARY STANDARDS/REFERENCES	1
6.0	PROCEDURE	1
6.1	Step 1: Report to CISO (Incident/Event)	1
6.2	Step 2: Conducting the Assessment/Incident Investigation	2
6.3	Step 3: Reporting the Assessment/Incident Investigation	4
7.0	RECORDS	1
8.0	RELATED DOCUMENTS	1

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	08/11/05	Original SIS-CT-025

1.0 PURPOSE

The purpose of this procedure is to provide guidance to Battelle Science and Technology International (BSTI) management, Health Services, Regional Safety Contacts, and BSTI Safety Health and Emergency Response (SHAER) Representatives to aid in the reporting, investigating, and documenting employee occupational injuries and illnesses in accordance with Occupational Safety and Health Administration (OSHA) regulations and reporting, investigating, and documenting other accidents/incidents and significant near misses in accordance with other regulatory agencies and BSTI requirements.

2.0 SCOPE AND APPLICABILITY

This procedure applies to all BSTI, including regional offices, and Health Services.

3.0 PREREQUISITES

The following prerequisites must be completed by staff members prior to using this procedure:

3.1 Training/Qualification:

a) None

3.2 Other:

a) None

4.0 DEFINITIONS

4.1 Document specific definitions:

- **Accident/Incident** – Any unexpected or unplanned occurrence that interrupts the work sequence or process and that may result in injury, illness, environmental impact, or property damage.
- **Cause(s), Root/Cause, and Contributing Causes** – Sometimes referred to as causal factors, what occurred that brought about an effect or a result. The agent that brings something about may involve rules, regulations, work practices, equipment/machinery, environmental conditions, at-attrib design, maintenance, how-abstracting, training, procedures, and other organizational weaknesses that create the conditions where human errors are likely to occur.
- **First Aid** – Any one-time treatment and any follow up visit for the purpose of observation of minor injuries which do not ordinarily require medical care (i.e., scratches, cuts, burns, splinters, and so forth). Each one-time treatment and follow up visit for the purpose of observation is considered first aid even though provided by a physician or registered professional personnel.
- **Illness** – Occupational illness of an employee is an abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

- **Injury** — Occupational injury is an injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment. Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals are considered to be injuries.
- **Lost Workday** — Includes days away from work, days of restricted work activity, or both. This only includes days that would normally have been worked and does not include the day the injury/illness occurred.
- **Manager/Supervisor** — The person responsible for the day-to-day supervision of the injured/ill worker or responsible for the area in which an incident or near-miss situation occurred. This may include any member of the employee's chain of command.
- **Medical Treatment** — Includes treatment (other than first-aid administered by a physician or by registered professional personnel under the standing orders of a physician). Medical treatment does NOT include first aid treatment, one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care⁶ even though provided by a physician or registered professional personnel.
- **Near-Miss** — A unplanned event which does not cause personal injury, illness, or death, or result in equipment or property damage, or environmental impact, but has the potential to do so.
- **Recordable Injury/Illness** — Work-related deaths caused by injuries and illnesses; and those work-related injury/illnesses which result in: loss of consciousness; restriction of work or motion; transfer to another job; or require medical treatment beyond first aid.
- **Restricted Work Activity** — A: An injured/ill employee's inability to perform all of his/her normal job duties over a normal work shift.
- **Scene/Site** — A location where accident/incident or near miss has taken place.

4.2. The following definitions can be found in Q5-RM-001, Glossary:

- **Corrective Action**

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

This procedure complies with the following regulatory and/or voluntary standard requirements.

5.1 Regulatory references:

- a) Title 29, Code of Federal Regulations, Part 1904, Recording and Reporting Occupational Injuries and Illnesses

- b) U.S. Department of Labor Bureau of Labor Statistics, December 17, 2002 Federal Register: Recordkeeping Guidelines for Occupational Injuries and Illnesses, or latest revision.
- c) BLS procedure: SIH-GP-008 Reporting and Recording Occupational Injuries and Illnesses, Revision 0, May 13, 2004 or latest revision.
- d) BLS's Opening Guide: Worker's Compensation Claims, 1988-1, May 1988 or latest revision.
- e) BLS's Opening Guide: Investigating/Reporting Accidents, 1310-1, February 1988 or latest revision.
- f) BLS's Opening Guide: First Aid/Injury Reporting, 1310-1, December 1974 or latest revision.

5.2 Voluntary standards

- a) None

6.0 PROCEDURE

The records referenced in SIH-GP-008 must be generated in addition to SIH-FM-004.

6.1 Reporting the Accident/Incident

- 6.1.1 Summon emergency help according to established emergency procedures for your location.
- 6.1.2 Offer assistance to injured ill coworkers based on your training and knowledge until emergency personnel arrives.
- 6.1.3 Report all occupational injuries or illnesses to your manager or designee immediately, but no later than close of the next business day.
- 6.1.4 Report other accidents or near misses to your manager or designee and record in any documentation.

6.2 Conducting the Accident/Incident Investigation

6.2.1 Notification

- 6.2.1.1 The worker's manager or their designee shall inform their manager, Regional Safety Contact, if applicable and their HSTI/SHRM Representative that an accident/incident has occurred.

6.2.2 Secure the Scene

The scene of any accident/incident should remain undisturbed until the investigator(s) implements the necessary security in the area and determines that recovery or normal operations may be resumed. Any machinery or equipment involved shall not be used until the investigator(s) determines that it may be used.

6.2.3 Witness Identification and Interviews

- 6.2.3.1 The manager or their designee shall gather and record pertinent information and the names of witnesses. If the worker's manager or their

designee is not available. The ranking on-site manager shall gather the information and record names of witnesses.

- 6.2.3.2 Witnesses to an accident/incident must be interviewed by the investigator to collect the date, information, and details to perform the investigation. Sketches or photographs are encouraged to document site/field conditions.

- 6.2.3.3 Where needed, appropriate technical experts may be consulted.

6.3 Documenting the Accident/Incident Investigation

- 6.3.1 Health Services shall record any visits to Health Services for an occupational injury or illness no matter how minor (including one-time first aid treatment) on the Daily Injury/Illness Log. Regional Office staff shall follow local injury or illness procedures.
- 6.3.2 SHH FM 404 Accident/Incident Analysis Form shall be completed by the manager or their designee to report and document any unexpected or unplanned occurrence that interrupts the work sequence or process and may result in injury, illness, environmental impact or property damage. The form is available on-line at: <http://aptforms.battelle.org/sites/default/files/default.aspx>. The form is to be filled out electronically and saved on the SharePoint team site page, which is <http://aptforms.battelle.org/sites/default/files/default.aspx>. A copy of the completed report will be provided electronically to the ESH&Q SHH Document Control/Records Specialist for inclusion in the ESH&Q Central Files.
- 6.3.3 SHH FM 404 Accident/Incident Analysis Form shall be completed by the manager or their designee within 48 hours or two working days of the accident/incident. It is noted that in some circumstances additional time will be required to perform a thorough investigation (e.g., in order to interview all witnesses and the injured/all worker visit the appropriate control with specialists, etc.) In these instances, the form shall be completed with available preliminary information, and updated as information becomes available.
- 6.3.4 Follow up and confirm the effectiveness and/or completion of corrective actions will be completed by the manager. The SHH Representative may participate.

7.0 RECORDS

A confidential record will be maintained by ESH&Q Control Files for five calendar years. Suitable electronic storage will meet this requirement.

Health Services will follow their records management, Batelle Policy and OSHA requirements.

Work-related injury and illness records must be maintained in accordance with SIH-GP-020, Reporting and Recording Occupational Injuries and Illnesses.

The following records are generated in the course of following this procedure:

Name of Record	Record Media	Location	Retention Period
SIH-FM-004, Accident/Incident Analysis Form	electronic	ESH&Q Control Files	5 years

8.0 RELATED DOCUMENTS

The following documents are referenced by this procedure:

- SIH-GP-020, Reporting and Recording Occupational Injuries and Illnesses (latest version)
- Batelle Operating Guide (specifically the following): Tab 600 Risk Management, Tab 1300 Safety and Tab 1600 Health Services
- BCO or BSTI Safe Work Practices Handbook (latest edition)
- SIH-FM-004, Accident/Incident Analysis Form: Document Number

Battelle Science & Technology International Safety and Industrial Hygiene Program

Title: Personal Protective Equipment Program

Number: SSTI-PPE-001

Revision: 0

Originator: Stephen McHenry 7/23/04
Stephen McHenry Date

Safety and Health Representative

Approved By: Donald Cagle 7/27/04
Donald Cagle Date

Manager, Safety, Health & Emergency Response

Reviewed By: Carl Pittman 7/22/04
Carl Pittman Date

Manager, Quality Management Systems & Training

Approved By: Mark E. Jackson 7/22/04
Mark Jackson Date

Manager, Regulatory Compliance

Approved By: W. Joseph Garton 7/23/04
W. Joseph Garton Date

Vice President, SSTI SH&Q

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	1
3.0	PREREQUISITES	1
3.1	Training	1
4.0	DEFINITIONS	1
5.0	REGULATORY/VOLUNTARY STANDARD REFERENCES	1
6.0	RESPONSIBILITIES	1
6.1	Safety & Health Representatives	1
6.2	Managers	1
6.3	Project Managers	1
6.4	Employees	1
6.5	BSI ESH&Q Training	1
6.6	Contractors	1
7.0	PROCEDURE	1
7.1	General Requirements	1
7.2	Hazard Assessment and/or Line Managers and Safety Representatives Shall Evaluate	1
7.3	PPE Selection	2
7.4	Specialized Training	3
Appendix A: Guidelines for Conducting PPE Hazard Assessments		4
Appendix B: Categories of Personal Protective Equipment and Selection Considerations		5

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	06/11/04	Document re-issued under new numbering system. (Previous Number SIR PP 001)

1.0 PURPOSE

This program is intended to provide guidance for compliance with the requirements of the Occupational Safety and Health Administration (OSHA) Standard, "General Requirements, Personal Protective Equipment (PPE)" 29 Code of Federal Regulations (CFR) 1910.132 and subsequent PPE regulations in the section of the CFR.

2.0 SCOPE AND APPLICABILITY

This program applies to all Battelle Science & Technology International (BSTI) staff, including required officers and field operations, and to all contractors performing work on Battelle property or on behalf of Battelle. This program establishes minimum performance requirements. This program does not include hearing protection, respiratory protection, PPE used for fall protection or laser eye protection. These items are covered in other programs.

3.0 PREREQUISITES

3.1 Training

New employees working in labs shall be provided with basic PPE awareness training. This is typically included in the new employee safety orientation.

4.0 DEFINITIONS

Personal Protective Equipment (PPE) - clothing and equipment provided to employees to prevent contact from identified workplace hazards.

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- U.S. Department of Labor: OSHA Standard, "General Requirements, Personal Protective Equipment" 29 CFR 1910.132
- U.S. Department of Labor: OSHA Standard, "Eye and Face Protection" 29 CFR 1910.133 and American National Standards Institute (ANSI) Z89.1, Occupational and Educational Eye and Face Protection
- U.S. Department of Labor: OSHA Standard, "Head Protection" 29 CFR 1910.135 and ANSI Z89.1, Standard for Industrial Protective Helmets
- U.S. Department of Labor: OSHA Standard, "Foot Protection" 29 CFR 1910.136 and ANSI Z41.1, Personal Protection - Protective Footwear
- U.S. Department of Labor: OSHA Standard, "Hand Protection" 29 CFR 1910.138
- Battelle "Safe Work Practices Handbook" (Latest Revision)

6.0 RESPONSIBILITIES

6.1 Safety & Health Representatives

- 6.1.1 Assist managers, supervisors and project staff in conducting hazard assessments and identifying proper PPE.
- 6.1.2 Ensure employees receive training on the PPE they are expected to use.
- 6.1.3 Periodically review, update and evaluate the overall effectiveness of the PPE program.

6.2 Managers

- 6.2.1 Ensure hazard assessments are completed for physical areas and projects under their department section/area.
- 6.2.2 Ensure that all affected staff are properly trained and qualified to use, maintain and store the PPE they are expected to wear.
- 6.2.3 Ensure reasonable PPE is readily available.
- 6.2.4 Ensure defective or damaged equipment is immediately replaced.

6.3 Project Managers

- 6.3.1 Ensure hazard assessments are completed for assigned projects.
- 6.3.2 Ensure staff assigned to projects have PPE training based on the hazard assessments.

6.4 Employees

- 6.4.1 Wear PPE as required
- 6.4.2 Attend required training
- 6.4.3 Use, maintain and store PPE as required.

6.5 BSHI ESH&Q Training

Ensure new employee safety orientation training is provided on a regular, timely basis.

6.6 Contractors

- 6.6.1 Contractors shall receive a copy of this program. Any questions should be directed to the Battelle contact.
- 6.6.2 Contractors may be asked to provide a copy of their PPE program and/or hazard assessments supporting the work to be performed on Battelle premises or on behalf of Battelle.

7.0 PROCEDURE

7.1 General Requirements

PPE alone should not be relied on to provide protection against hazards, but should be used in conjunction with engineering controls, and administrative controls.

7.2 Hazard Assessment and/or Line Managers and S&H Representatives Shall Evaluate

- 7.2.1 Each work place or work activity where Battelle employees are exposed to hazardous conditions shall be evaluated to determine the need for PPE and what PPE is necessary.
- 7.2.2 The Safety and Health Representative in conjunction with the Manager/Supervisor or designee shall evaluate anticipated or actual work conditions, job categories, or activities to determine what PPE is necessary. See Appendix A for examples of hazard categories.
- 7.2.3 Hazard assessments shall be documented. Safe Work Plans and Standard Operating Procedures are examples of documents which may be used to document hazards and assessments. For organizations that do not have an internal method to document form SIH-PM-007 Personal Protective Equipment Hazard Assessment Certification may be used.

- 70.4 When work place conditions, physical locations, materials in use or activities change, Line Managers and S&H Representatives reassess the hazards and re-assess the suitability of the PPE. Update written documentation if necessary.

7.3 PPE Selection

- 7.3.1 Selection of PPE shall be based upon provision of a level of protection equal to or greater than the minimum required to protect from hazards identified in the hazard assessment.
- 7.3.2 The OSHA standards in the reference section include specific considerations based on the types of protection necessary (e.g. eye, hand, head). Each of these standards also incorporates, by reference, standards that identify requirements (typically equivalent standards developed by the American National Standards Institute) for PPE. When making PPE selections, familiarity with these references will ensure proper PPE selection. See Appendix B for selection guidance.

7.4 Specialized Training

- 7.4.1 Use of PPE that requires specialized training will be provided at the time the PPE is issued to or selected for affected employees.
- 7.4.2 Retraining shall be provided if an employee demonstrates deficiency in using or caring for PPE based on information provided in previous training.
- 7.4.3 Retraining also is required if there are significant changes in the workplace that render the previous training obsolete.

8.0 RECORDS

Name of Record	Record Media	Location
Hazard Assessments	Paper or electronic	Safety Groups
Training records	Paper	SSHS Q-Control Files

9.0 RELATED DOCUMENTS

- OSH 70-027 Personal Protective Equipment Hazard Assessment Form
- Battelle's Safe Work Practices Handbook

Appendix A: Guidelines for Conducting PPE Hazard Assessments

Conduct a walk-through survey of the area in question. The purpose of the survey is to identify sources of hazards to workers and co-workers.

Consideration should be given to the basic hazard categories:

- Impact
- Penetration
- Compression / roll over
- Chemical
- Heat
- Harmful dust
- Light (optical) radiation

During the walk-through observe:

- Sources of motion, i.e. machinery or processes where any movement of tools, machine elements or particles could exist, or movement of personnel that could result in collision with stationary objects.
- Sources of high temperature that could result in burns, eye injury or ignition of protective equipment, etc.
- Types of chemical exposures.
- Sources of harmful dust.
- Sources of light radiation, i.e. welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.
- Sources of falling objects or potential for dropping objects.
- Sources of sharp objects which might pierce the feet or cut the hands.
- Sources of rolling or crushing objects which could crush the feet.
- Layout of workplace and location of co-workers.
- Electrical hazards.
- In addition, injury/accident data should be reviewed to help identify problem areas.

Appendix B. Categories of Personal Protective Equipment and Selection Considerations

Eye and face protection: The following chart provides general guidance for the proper selection of eye and face protection to protect against hazards associated with the listed hazard "source" operations:

Source	Assessment of Hazard	Protection
IMPACT Chipping, grinding, machining, assembly work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding	Flying fragments, objects, large chips, particles, sand, dirt, etc.	Spectacles with side protection, goggles, face shields. See notes (1), (11), (13), (14), (15). For severe exposure, use faceshield.
HEAT Furnace operations, pouring, casting, hot chipping, and welding	Hot sparks Splash from molten metals High temperature exposure	Faceshield(s), goggles, spectacles with side protection. For severe exposure use faceshield. See notes (11), (12), (13). Face shields worn over goggles. See notes (11), (12), (13). Screen face shields, reflective face shields. See notes (11), (12), (13).
CHEMICALS – acid and chemicals handling, degreasing, plating	Splash Irritating mists	Goggles, visors and cover hoods. For severe exposure, use face shield. See notes (11), (12). Special-purpose goggles.
DUST – sandblasting, buffing, general dusty conditions	Respirable dust	Goggles, visors and cover hoods. See note (11).
LIGHT and/or RADIATION – welding, electrical arc	Optical radiation	Welding helmets or welding shields. Typical shades 10-14. See notes (11), (12).
Welding Gas	Optical radiation	Welding goggles or welding face shield. Typical shades gas welding 4-8; cutting 3-8, brazing 3-4. See note (11).

Cutting, torch burning, torch and welding	Optical radiation	Spectacles or welding face shields. Typical shades 1, 5-8. See notes (39), (40)
Blows	Face visors	Spectacles with shaded or special-purpose lenses, as suitable. See notes (51), (52)

Notes to Eye and Face Protection Selection Chart

- (1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.
- (2) Optic nerve prosthesis and eye disc, cornea light radiation. As required by the standard, protection from both hazards must be provided.
- (3) Face shields should only be used over primary eye protection (spectacles or goggles).
- (4) As required by the standard, filter lenses must meet the requirements for shade designation in ANSI Z87.1-83. Tinted and shaded lenses are not filter lenses when they are cracked or scratched at such.
- (5) As required by the standard, persons whose vision requires the use of prescription eyeglasses must wear either protective devices lined with prescription (Rx) lenses or protective devices designed to be worn over any clear prescription (Rx) eyeglasses.
- (6) Persons of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dirty and/or chemical environments may represent an additional hazard to contact lens wearers.
- (7) Adequate conditions and the restricted ventilation of the protective room, worn lenses to fog. Frequent clearing may be necessary.
- (8) Welding helmets or face shields should be used only over primary eye protection (spectacles or goggles).
- (9) Non-vented shields are available for facial protection only. Not an adequate eye protection for the reasons and operations listed for "impact."
- (10) Ventilation should be adequate but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.
- (11) Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

Filter lenses for protection against radiant energy are listed below for various operations with the appropriate shade numbers.

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Arc A/C in	Acetylene Welding	Minimum Protection ¹
Shielded metal arc welding	Less than 3	Less than 10	7
	3-8	40-140	8
	8-12	140-230	10
	More than 12	230-330	11
Gas metal arc welding and flux cored arc welding		Less than 40	7
		40-140	10
		140-230	10
		230-330	10
Gas tungsten arc welding		Less than 20	6
		20-120	8
		120-200	10
Arc cutting Arc cutting	Light	Less than 500	10
	Heavy	500-1000	11
Flame arc welding		Less than 20	6
		20-120	8
		120-400	10
		400-600	11
Flame arc cutting	Light ^{2,3}	Less than 200	8
	Medium ^{2,3}	200-400	8
	Heavy ^{2,3}	400-600	10
Thick burning		---	3
Thick cutting		---	2
Carbon arc welding		---	14

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Arc A/C in	Acetylene Welding	Minimum Protection ¹
Cut welding	Light	Under 1.0	4
	Medium	1.0 to 1.5	5
	Heavy	Over 1.5	6
Oxygen cutting	Light	Under 25	3
	Medium	25 to 150	4
	Heavy	Over 150	5

¹⁰ As a rule of thumb, start with a shade that is too dark to see the work area. Then go to a lighter shade which gives sufficient view of the work area without going a high yellow light, then determine to use a filter lens that absorbs the yellow or sodium line in the visible light of the spectrum of operation.

¹¹ These values apply when the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is defined by the work piece.

Head protection: All head protection (helmet) is designed to provide protection from impact and penetration hazards caused by falling objects. Head protection is also available which provides protection from electric shock and burn. When selecting head protection, knowledge of potential electrical hazards is important.

- Class A helmets in addition to impact and penetration resistance provide electrical protection from live voltage conductors (they are proof tested to 2500 volts)
- Class B helmets in addition to impact and penetration resistance, provide electrical protection from high-voltage conductors (they are proof tested to 50-000 volts)
- Class C helmets provide impact and penetration resistance (they are usually made of aluminum which conducts electricity) and should not be used around electrical hazards

When falling object hazards are present, helmets must be worn. Some examples include: working below other workers who are using tools and materials which could fall; working around or under conveyor belts which are carrying parts or materials; working below machinery equipment which might cause material or objects to fall; and working on exposed energized conductors. Some examples of occupations for which head protection should be routinely considered are: carpenters, electricians, linemen, mechanics and repairmen, glaziers and pipe fitters, assembler/packer, warehouse workers, oilfield laborers, freight handlers, trailer-coupling and logging, stock handlers, and warehouse laborers.

Foot protection: Safety shoes and boots which meet the ANSI Z41-1991 Standard provide both impact and compression protection. If foot compression protection can be obtained which provides puncture protection, in some work situations, additional protection should be provided, and in other special situations electrical conductors or insulating safety shoes would be appropriate.

Safety shoes or boots with impact protection would be required for carrying or handling materials such as packages, objects, parts or heavy tools which could be dropped, and for other activities where objects might fall onto the feet. Safety shoes or boots with compression protection would be required for work activities involving steel tracks (metal or wooden handling carts), animal hoist rolls (such as paper rolls) and animal hoover pipes, all of which on fall potentially will over an employee's feet. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, broken concrete, large staples, sharp metal etc., could be stepped on by employees during a footstep.

Some occupations (e.g., complete lists for which foot protection should be routinely considered are: shipping and receiving clerks, stock clerks, carpenters, electricians, machinists, mechanics and repairmen, glaziers and pipe fitters, structural metal workers, assemblers, day-lab installers and laborers, packers, warehouse custom packers and shipping press operators, warehouse workers, laborers, freight handlers, gardeners and grounds keepers, trailer-coupling and logging workers, stock handlers and warehouse laborers.

Hand protection: Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure. CEHA is unaware of any gloves that provide protection against all potential hand hazards, and commonly available glove materials provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused.

It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated, e.g., chemical hazards, cut hazards, flame hazards, etc. These performance characteristics should be assessed by using standard test procedures. Before purchasing gloves, the employer should request information from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. Other factors to be considered for glove selection as general include:

(A) As long as the performance characteristics are acceptable, in certain circumstances, it may be more cost-effective to regularly change cheaper gloves than to wear more expensive types.

(B) The work activities of the employee should be studied to determine the degree of dexterity required, the duration, frequency, and degree of exposure of the hands, and the physical stresses that will be applied.

With respect to selection of gloves for protection against chemical hazards:

(A) The basic properties of the chemical(s) must be determined, in particular, the ability of the chemical to cause local effects on the skin *and/or* to pass through the skin and cause systemic effects.

(B) Generally, any "chemical resistant" glove can be used for dry protection.

(C) For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials.

(D) Employees must be able to remove the gloves in such a manner as to prevent skin contamination.

Other broad categories of gloves include:

- **Fabric** - Made of cotton or fabric blends; generally used to remove grime when handling slippery objects. Also help insulate from heat, heat or cold.
- **Leather** - Generally used to guard against abrasion from spalls or scrape against rough surfaces. Also used as combination with an insulated liner when working with electricity.
- **Knit and mesh** - Used to protect from accidental cuts and scratches. Used when working with cutting tools or other sharp instruments.
- **Aluminized** - made of aluminized fabric and designed to insulate hands from intense heat.

Battelle Science & Technology International**Safety and Industrial Hygiene
Program Plan**

Title	Safety and Health Management Program
Number	SIH/PP-100
Revision	0

Originator


Donald Cagle

11/11/04

Date

Manager, Safety, Health, & Emergency Response

Reviewed By


Mark Jackson

11/4/04

Date

Manager, Regulatory Compliance

Reviewed By


Curt Plummer

11/5/04

Date

Manager, Quality Management Systems &
Training

Approved By


N. Joseph Garcia

11/11/04

Date

Vice President, B&T ESH&Q Systems
Management

Concurrence


Mary Davis

11/11/04

Date

Vice President, Operations & Systems
Services

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	2
3.0	PROGRAM REQUIREMENTS	3
4.0	PROGRAM OBJECTIVES	4
5.0	PROGRAM DESCRIPTION	5
5.1	Human Resources Management	5
5.2	Facilities Development and Maintenance	5
5.3	Documentation and Safety Work Practices	5
5.4	Contractor Review and Approval	5
6.0	ROLES AND RESPONSIBILITIES	6
6.1	Executive Vice President/CEO	6
6.2	General Manager/Divisional Director	6
6.3	Vice President - ESH/General Safety Services	6
6.4	Vice President - ESH/Construction Management	6
6.5	Loss and Incident Management	6
6.6	Safety Health and Environment Practices	6
6.7	Other	6
7.0	INTERACTIONS WITH OTHER PROGRAMS	8
8.0	METHODS FOR EVALUATING PROGRAM EFFECTIVENESS	9
9.0	TRAINING	9
10.0	PROGRAM ASSESSMENT/SAUDIT	9
11.0	PROGRAM REVIEW	9
12.0	ASSOCIATED PROCEDURES AND FORMS	8
APPENDIX A: SHH GUIDANCE FOR PROPOSAL WRITERS AND PROJECT MANAGERS		8
APPENDIX B: SHH SUBJECT MATTER EXPERT SAFETY REVIEW COMMITTEE		12

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	11/15/04	Replaces SHH PP 001, Formation of a Safety Steering Committee

1.0 PURPOSE

Battelle is committed to establishing and maintaining an accident, injury, and occupational illness-free environment. Battelle corporate policy 1.6 Environmental, Safety and Health Program states "It is Battelle policy to comply with the letter and spirit of all environmental safety and health (ES&H) laws and regulations." ALL staff must plan and conduct their work in a responsible manner to create and maintain a safe and healthy environment in Battelle Science & Technology International (BSTI) facilities and projects. The purpose of this program is to describe the operational framework and guidelines to address safety and health issues within BSTI.

2.0 SCOPE AND APPLICABILITY

This program is applicable to all BSTI staff and operations, including those involved in office laboratory, pilot plant and field work originating from King Avenue West/Jefferson and regional locations. The plan identifies related administrative and operating procedures, designates responsibilities and accountability, and describes work practices necessary to protect staff, facilities, and the public.

3.0 PROGRAM REQUIREMENTS

This program is written to describe how BSTI intends to comply with applicable regulatory and/or voluntary standard requirements:

- Occupational Safety and Health Administration (OSHA), General Industry and Construction Standards and references contained therein
- Ohio Public Building Code/Ohio Plm Code
- National Fire Protection Association (NFPA), applicable standards
- Battelle Operating Guide, Section 1.360 Environment, Safety and Health
- Battelle Corporate Policy 1.6 Environmental, Safety and Health Program
- Battelle Safe Work Practices Handbook

4.0 PROGRAM OBJECTIVES

The objectives of this program are to:

- Describe the overall management of Safety and Health (S&H) for BSTI.
- Define the key elements and processes of S&H employed by BSTI
- Define key roles and responsibilities for implementing S&H
- Provide the framework by which BSTI will comply with Battelle's Corporate Policy on ES&H

5.0 PROGRAM DESCRIPTION

The safety and health program provides a framework for hazard identification and evaluation, procedure development and documentation of safe work practices.

5.1 Hazard Identification and Evaluation

- 5.1.1 All proposed new projects within ESTI are cleared through the Integrated Risk Assessment Process.
 - 5.1.1.1 As a part of this process, project staff are asked to complete an Environment, Safety, Health and Quality (ESH&Q) Risk Assessment Questionnaire to identify any elements of the proposed project with safety considerations.
 - 5.1.1.2 The completed proposal, scope and questionnaire are reviewed by appropriate members of the ESTI Environment, Safety, Health and Quality Systems Management (ESH&Q SM) staff. Questions and concerns are brought directly to the attention of the project staff.
 - 5.1.1.3 To assist project staff in preparing the ESH&Q section of the Integrated Risk Assessment questionnaire during the proposal process, guidance is provided in Appendix A.
- 5.1.2 Upon project award or initiation, project staff assigned to the project are responsible for implementing appropriate safety controls and procedures. The assigned S&H representative works closely with project staff to ensure implementation of all safety requirements (sections 5.2 and 5.3).
- 5.1.3 Some projects require specialized knowledge and review to identify potential hazards. To address this, ESTI has several subject matter expert committees formed to provide expertise and establish safety requirements in certain areas. See the section on Safety Review Committees (section 5.4) and Appendix P.

5.2 Program Development and Implementation

- 5.2.1 Safety and Health procedures within the Safety and Industrial Hygiene Manual are the primary documentation of S&H requirements.
- 5.2.2 ESTI ESH&Q SM will provide S&H subject matter expertise and support and will provide programs and program documentation at the ESTI level.
- 5.2.3 Each ESTI organization code will have a designated S&H Representative from within ESTI ESH&Q SM. The S&H Representative will perform with site staff to identify safety and health concerns for each site and assist in program implementation. The Sitefile abstract identifies the S&H Representatives.

5.3 Documentation of Safe Work Practices

- 5.3.1 Writing safe work practices, to identify safe work processes and procedures in the performance of projects, will be used to document and communicate instructions and information to staff. These may be in the form of Standard Operating Procedures, Safety Plans/Test Plans, Fact Sheets or similar documents. The tasks or station identified in the safe work practices will assist in

determining the training and qualification requirements. Appendix A provides a project planning and project operations phase list of items that should be considered to help determine if written safe work practices are needed for the project.

- 5.3.2 Project implementation may require documentation specific to the project or working group in addition to documents referenced in 5.2.2. Project staff and the SH Representative will work together to ensure proper requirements and procedures are documented.

5.4 Committee Review and Approval

- 5.4.1 BSH will establish safety committees to facilitate safety program implementation. There will be committees at the BSH level as well as committees embedded within product lines.
- 5.4.2 BSH will establish a Safety Steering Committee overseen by the Vice President, ES&H QSM, to establish and review goals and expectations for the BSH safety program. The Safety Steering Committee will also serve as a review committee for significant hazards not covered by other subject matter expert review committees.
- 5.4.3 The Safety Steering Committee will be made up of representatives from Safety and Health, Facilities, Health Services, Emergency Management, Research Management, Security, Human Resources and appropriate subject matter experts as necessary.
- 5.4.4 As a guideline, projects require review by the Safety Steering Committee when:
- A substantial potential exists for escape of, or contact with, toxic gases, vapors, particulates, or liquids resulting in an exposure or environmental release in violation of applicable regulations, established guidelines or rules of good practice.
 - A potential exists for substantial exposure to, or contact with, gases, vapors, particulates, or liquids whose toxic hazards have not been investigated or shown to be acceptable through burn-in experience.
 - Work involves unusually large quantities of a hazardous material, or when staff is inexperienced in handling hazardous materials of the proposed type or quantity.
 - A potential exists for use or formation of explosive substances, or when explosive materials inside standard equipment and facilities designed for such purposes are used.
 - A potential exists—as is likely to be perceived—for members of the public to be exposed to a hazard (other than routine traffic hazards) arising from a facility operation.
 - Operations of a type that require review, as indicated above, occur in a facility that is newly constructed or substantially altered.

- A potential costs for operations involving hazards associated with the following when conducted in areas not specifically or previously approved:
 - High structures
 - Confined spaces, e.g., sewers, tunnels, tanks, and pits
 - Diving requiring decompression
 - Unusual electrical hazards
 - Workplaces over or in or near bodies of water
 - Unusual work procedures
 - Agressive or hostile environments, e.g., jungles and war zones
 - Heat or cold exceeding work stress criteria
 - High stored energy systems.

- 5.4.5 All the BEST1 level appropriate subject matter expert committees will be established to address a specific project safety concerns. Each of the subject matter expert committees will have a defined purpose and operational scope. A brief description of the current subject matter expert committees is provided in Appendix B.
- 5.4.6 Operational Safety Committee will be established within a product line. The current organizational structure will be used to establish where safety committees are appropriate. The assigned S&H Representative will assist line management in establishing the committee and serve as a subject matter expert to the committee.
- 5.4.7 The Operational Safety Committees are expected to:
- 5.4.7.1 Meet at least quarterly
 - 5.4.7.2 Be composed of a representative cross-section of staff in the product line or group for which the committee is established
 - 5.4.7.3 Focus on supporting the safety needs of the operational area or product line for which it was established to:
 - Increase safety awareness and knowledge
 - Identify opportunities for improvement
 - Recommend improvement ideas to leadership team
 - Share success stories
 - Seek answers on safety matters
 - Promote and recognize safe behaviors
 - Set the example of safe performance
 - Actively communicate safety

6.0 ROLES AND RESPONSIBILITIES

All B57I staff are expected to contribute to establishing and maintaining a safe and healthy working environment. Written procedures that identify program requirements include specific responsibilities. The following roles and responsibilities have been defined for implementing the program.

6.1 Executive Vice President B57I

- 6.1.1 Provide active leadership for effective implementation
- 6.1.2 Assume responsibility for the safe overall operation of B57I
- 6.1.3 Provide a safe and healthy working environment for B57I staff
- 6.1.4 Provide resources necessary to ensure continuous improvement

6.2 General Manager/Division Leaders

- 6.2.1 Ensure program implementation and compliance within the division
- 6.2.2 Take ownership of the safety program within their division

6.3 Vice President, B57I Operations & Systems Services

- 6.3.1 Provide S&H support to the Executive Vice President B57I
- 6.3.2 Oversee the Environment, Safety, Health and Quality Systems Management for B57I
- 6.3.3 Ensure Battelle staff are provided a healthy and safe environment

6.4 Vice President, ESH&Q Systems Management

- 6.4.1 Ensure implementation of Battelle and B57I policy
- 6.4.2 Provide S&H oversight, support and assessment to facilitate effective operations and identify regulatory compliance requirements to enable management to meet their responsibilities
- 6.4.3 Ensure development and management of ESH&Q plans and applicable programs
- 6.4.4 Establish and oversee operation of the Safety Steering Committee and establish Committee operating procedures

6.5 Line and Support Management

- 6.5.1 Implement safety and health programs within their respective organizations
- 6.5.2 Ensure staff engage S&H resources when the level of expertise required is beyond their knowledge
- 6.5.3 Ensure staff in their area of responsibility receive necessary training

6.6 Safety, Health and Emergency Response

- 6.6.1 Reports directly to the Vice President, ESH&Q SM to provide subject matter expertise in the development, implementation and oversight of S&H plans and programs

- 6.6.2 Serve as a direct resource to ESTI management and staff to provide high quality technical support for implementing Safety, Health and Emergency Response programs.
- 6.6.3 Conduct audits and inspections to help contractors work and educate project staff on S&H to ensure a safe work environment.
- 6.6.4 Assist project teams in estimating and pre-planning for safe conduct of projects.
- 6.7 **Staff**
 - 6.7.1 Work safely at all times and maintain safe work conditions in accordance with safety procedures.
 - 6.7.2 Make suggestions for safety improvement.

7.0 INTERFACES WITH OTHER PROGRAMS

The S&H Management Program interfaces with the following programs and/or functions within ESTI to ensure comprehensive implementation of S&H requirements. Each of these interfaces helps to ensure ESTI's ability to conduct and deliver quality products and services that meet or exceed compliance with applicable regulations. These programs are designed not to overlap but to provide complete coverage of applicable regulatory requirements.

- **Environmental Protection** – ensure safe removal of hazardous waste from laboratories and identification of significant environmental impacts resulting from projects or operations.
- **ESTI Quality Management Systems and Training** – provide document control, records management, and safety training.
- **ESTI Regulatory Compliance Management** – ensure timely identification of new or changing regulatory compliance to facilitate integration into existing programs and procedures.
- **Radiation Safety** – provide review and oversight of projects and operations using radioactive materials.
- **Medical/Health Services** – provide medical response to injuries and illnesses occurring on site and establish health screening criteria for job eligibility.
- **Shipping and Receiving** – ensure proper shipment of hazardous materials and identification of hazardous materials upon receipt.
- **Facilities** – review design and construction of facilities and interface on facilities maintenance.
- **Purchasing** – establish and implement procurement procedures for hazardous materials and equipment.
- **Proposals/Contracts** – ensure significant S&H hazards are identified during the proposal stage to ensure resources are included in the project before award.
- **Human Resources** – thoroughly identify job requirements to select qualified and capable candidates and identify jobs requiring health screening prior to employment.

- Legal – review BSTD procedures (when appropriate) to ensure compliance and provide interpretations of regulatory or other requirements.

This plan is a high level document under which more detailed Safety and Health General (GPI), Specific (SPI) and Equipment Procedures (EP) define specific program requirements. In addition, Work Instructions (WI), Forms (FM) and Training Material (TM) may be developed to support the program and procedures.

8.0 METRICS FOR EVALUATING PROGRAM EFFECTIVENESS

Metrics will be used as indicators of program effectiveness. A limited number of high level metrics will be defined and presented to senior leadership as periodic indicators of performance. Metrics will be defined in procedures and work instructions. Information collected from these metrics will be used to develop and roll up to the high level metrics. These will include both leading and lagging indicators. Leading indicators include items such as employee safety training hours and safety committee participation by management. Lagging indicators include such items as OSHA, injury and illness data, regulatory citations or violations.

9.0 TRAINING

- 9.1 All new BSTD employees will receive a new employee safety orientation.
- 9.2 Once a new employee reports to his/her specific area, the responsible manager or supervisor is responsible for providing an orientation to the work area which will include basic safety items.
- 9.3 Additional safety training requirements may be identified in BSTD program plans created by the S&H organization.
- 9.4 Safety training requirements implemented to satisfy client requirements will be documented in project or product line procedures and documents.

10.0 PROGRAM ASSESSMENTS/AUDITS

- 10.1 Assessment and audits required for regulatory compliance will be specified in procedures and work instructions.
- 10.2 BSTD S&H Representatives will conduct facility walk-throughs of all active laboratory and non laboratory (receptionist working spaces) at least twice a year.
- 10.3 Areas undergoing facilities construction/renovation/demolition will be evaluated to determine appropriate safety requirements. The BSTD Risk Assessment Form for Renovation/Construction Work (see Section 12.8) focuses on safety review of facilities activities.
- 10.4 Office locations will be audited on an as needed or as requested basis. Selected office locations will be audited annually.

11.0 PROGRAM REVIEW

This program shall be reviewed every 2 years at a minimum.

12.0 ASSOCIATED PROCEDURES AND FORMS

The following documents are associated with this program.

- ICD-PP-003 ESH&Q Training Program
- HRS-MN-001 Human Subjects Research
- RS-MN-001 Radiation Safety Manual
- EN-PP-003 Environmental Management Plan
- SIH-MN-001 Safety and Industrial Hygiene Manual Documents
- SIH-FM-113 BSI Risk Assessment Form for Restoration/Construction Work

APPENDIX A. SHH GUIDANCE for PROPOSAL WRITERS and PROJECT MANAGERS

Use of this checklist is not mandatory. Reviewing checklist contents prior to completing the ES&H Q Integrated Risk Assessment questionnaire during the proposal process may help in completing the questionnaire. In addition, the checklist may also be consulted prior to preparing project plans to help ensure all safety elements are addressed.

I. Creating/Proposal Steps

- A. Does the project or task involve unusual hazards such as:
- ☐ Hazardous chemicals/toxins, carcinogenic, pyrophoric, corrosive, etc.
 - ☐ Reactive or explosive chemicals
 - ☐ High pressures, e.g., pressure vessels operating above 15 psig
 - ☐ High temperatures, e.g., above 500 F
 - ☐ High electrical voltage/currentage, e.g., above 240 V/80 amps
 - ☐ Other high stored energy operations, e.g., flywheels, springs, suspended weights, hydraulics
 - ☐ Hazardous structural tests
 - ☐ High structures including non-elevated work, ladders, and scaffolding
 - ☐ Confined spaces
 - ☐ Low-volt classed
 - ☐ Other non-ionizing radiation, e.g., EMP, microwaves, radar, etc.
 - ☐ Watercraft
 - ☐ Diving operations not at King Avenue
 - ☐ Aircraft
 - ☐ Biological, pathogenic or GHS/BSA work
 - ☐ Ionizing radiation, e.g., radionuclides, sealed/unsealed sources, radio equipment
 - ☐ Probable exposure of the public to above hazards
 - ☐ Providing a product or system with operating instructions and procedures to clients
 - ☐ Providing ES&H or regulatory recommendations to clients
 - ☐ Firearms, ammunition or weapons
 - ☐ Operating powered industrial vehicles
 - ☐ Power-actuated tools
 - ☐ Trenching/excavating
 - ☐ Working with animals

- B. Do any of the above (checked) items trigger a special review by one of the Columbia Safety Review Committees (see Appendix B)? If so, contact the committee representative.
 - C. Do any of the above (checked) items require an increase in time for reviews, training of staff, etc., additional equipment for protective devices or controls, or facilities for explosion proof wiring, ventilation, or large special space that would result in an increase of money or loading?
 - D. Do any of the above (checked) hazards result in unusual disposal or storage costs especially at the end of the project? Especially difficult items for disposal are PCBs, dioxins, mercury, asbestos, cyanides, radioactive sources, and radioactive wastes mixed with hazardous chemicals.
 - E. Submit ESH&Q Questionnaire when completing the Integrated Risk Assessment Process (proposal) if applicable.
- II. Pre-project/Pre-operation Stage – Use the following questions to help identify what could go wrong and may pose a safety hazard to operations once they are underway.
 - A. Is equipment (e.g., gloves, masks, piping, machinery, etc.) designed and sized properly?
 - B. Does the project involve the use of machinery, such as forklifts, cranes, ladders, driving equipment, etc.? If so, are appropriate controls (i.e., procedures, training, etc.) in place?
 - C. Are other project hazards (e.g., chemicals, chemical products, electrical hazards, mechanical hazards, use of radioactive materials, etc.) involved?
 - D. Are documented safe work practices already exist for the hazards identified or do they need to be developed (Documentation of Safe Work Practices, Section 5.3.1)? Have documented safe work practices been reviewed by the ESH Representative?
 - E. Is appropriate emergency equipment (e.g., fire extinguishers, safety showers, electrical cut offs, ventilation, spill clean up kits, etc.) in place and serviceable based on the identified hazards and equipment use, available and in good working order?
 - F. Do identified hazards, or safe work practices, indicate the need for any of the following?
 - Properly trained and qualified personnel to use any equipment or machinery.
 - Properly informing staff of safe work practices, including emergency response.
 - Use of proper personal protective clothing and equipment.
 - Steps and procedures to minimize wastes and disposal costs.
- III. Project/Operational Stage
 - A. Are periodic inspections necessary to ensure safe facilities (e.g., conducting monthly ESH inspections of the area(s) including checks of the fire extinguishers, breach boxes, eye wash, deluge showers, spill kits, etc.)?
 - B. Are safe work practices and procedures instituted to ensure they are being followed?
 - C. Are practices modified when inadequate or no open time exists?

- D. Are wastes disposed or regularly to minimize build up of hazardous chemicals and potential wastes?
- E. Is recurring training necessary for long projects?

APPENDIX B BSH SUBJECT MATTER EXPERT SAFETY REVIEW COMMITTEES

Biological Safety Committee

Reviews and approves all research activities and specific practices for handling biological materials including organisms at the biosafety level 3 (BSL-3) and Select Agents defined by 42 CFR 73.

Human Subjects Committee

Reviews all research activities in which humans are to be used as subjects for experimental procedures or treatment, and includes questionnaires that are to be used to sample opinions, test reactions, or collect other data from humans.

Institutional Biosafety Committee

Reviews all research activities and specific practices for constructing and handling recombinant DNA molecules. The committee will also review work with organisms and viruses containing recombinant DNA molecules.

Laser Safety Committee

- 12.1.1. Provides general oversight for the Laser Safety Program including reviewing accident investigations, recommending corrective actions, reviewing procedure modifications, approving installations and working on warning signs or labels specific to laser systems.

Pressure Vessel and Systems Safety Committee

Reviews pressure vessels and systems when research or project related units are designed to contain liquids or gases with the following pressure and volume parameters:

- Liquid-containing units (e.g., hydraulic) operating at 1000 psig (pounds per square inch gauge) with no regard to volume.
- Gas containing units (e.g., autoclaves) that operate at 5 psig minimum. A NP meet the pressure-volume factor (P x V) of 5 psig-cuft or greater. The P x V is calculated by multiplying psig by cubic feet.

For example: the following pressures and volumes meet or exceed the P x V of 5 psig-cuft: 5 psig @ 1 cubic feet (ft³), 10 psig @ 0.5 ft³, 40 psig @ 0.125 ft³, 2000 psig @ 0.0025 ft³ (or 4.32 cubic inches). Units operating below 5 psig, of any size, are not considered pressure vessels or systems by the Committee.

Radiological Safety Committee

The Radiation Safety Manual (BSM) includes a detailed list of projects and situations that require review by the Radiological Safety Committee. Any project or operation using radiological material should consult the BSM to determine if review is needed.

Risk Management Committee

Reviews all contractual or operational risks considered above normal. Reviews are performed during the procurement and proposal stage prior to making a contractual commitment through the Risk Assessment process.

Battelle Science & Technology International Safety and Industrial Hygiene Program Plan

Title Chemical Safety Information Program

Number SITI-SP 004

Revision 3

Originator

Bernard Huzarolsch

Bernard Huzarolsch

Health and Safety Representative

12/12/06

Date

Reviewed By

Donald Cagle

Donald Cagle

Manager Safety and Health, and Emergency
Response

12/12/06

Date

Approved By

M. Joseph Gaskins

M. Joseph Gaskins

Vice President, BSI ESH&Q

12/21/06

Date

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	1
3.0	REGULATORY/VOLUNTARY STANDARD REFERENCES	1
4.0	RESPONSIBILITIES	1
4.1	PROJECT LINC MANAGEMENT	1
4.2	SAFETY AND HEALTH REPRESENTATIVE	1
5.0	PROCEDURE	2
5.1	MATERIAL SHEETS DATA SHEETS (MSDS)	
5.2	CONTAINER LABELING	
5.3	EXPOSURE MONITORING	
5.4	RELEASE DETERMINATION AND EVALUATION	4
6.0	LABORATORY OPERATIONS	4
6.1	CONTROL MEASURES	4
6.2	HIGHLY HAZARDOUS MATERIALS	4
6.3	MSDS at CONCENTRATION	4
7.0	NON-LABORATORY OPERATIONS	6
7.1	NON-LABORATORY AVAILABLE EXPERIMENTS	6
7.2	HAZARDOUS NON-RESEARCH TASKS	6
7.3	OUTSIDE CONTRACTOR PERSONNEL	7
8.0	TRAINING	8
8.1	GENERAL HAZCOM and Lab Standard Training	8
8.2	SPECIAL HAZCOM and Lab Standard Training Procedures	8
9.0	PROGRAM REVIEW	8
10.0	ASSOCIATED PROCEDURES	8
APPENDIX A COMPLIANCE CHECKLIST		10
APPENDIX B RECOMMENDED HANDLING PRACTICES FOR HIGHLY HAZARDOUS CHEMICALS		11

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	06/24/04	Original SOP-P-001
1	08/24/05	Updates document numbers and clarified information on labeling requirements.
2	10/24/06	Editorial changes, and changes for clarification and updating.

1.0 PURPOSE

The purpose of this program is to provide Battelle staff with information regarding Battelle Science and Technology International (BSTI) operations and methods of complying with the requirements of the Occupational Safety and Health Administration (OSHA) regulations, the "Hazard Communication" or "HAZCOM" (29 CFR 1910.1200) standard and the "Occupational Exposure to Hazardous Chemicals in Laboratories" or "Lab Standard" (29 CFR 1910.1450) standard. Both regulations require written programs. BSTI has addressed the requirements of both standards as they apply to Battelle operations in one written program: the Chemical Safety Information Program (CSIP). The CSIP is to be used both as a written Hazard Communication Program and a written Chemical Hygiene Plan for general BSTI operations. Specific operations may require job specific hazard communication.

The intent of both standards is to inform staff of

- How to identify/determine the hazards of the chemicals with which they work
- The steps that can be taken to protect their health and safety
- Measures that they can take to protect themselves from chemical hazards
- The safety and health resources available to them and how they can obtain these resources

2.0 SCOPE AND APPLICABILITY

This program applies to all BSTI operations that use, handle, or store hazardous chemicals. This includes all laboratories and other locations, such as field operations, pilot plants, machine shops, construction shops and paint shops that use, handle, or store hazardous chemicals. This program does not apply to offices and other areas that do not use, handle, or store hazardous chemicals.

3.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- OSHA 29 CFR 1910.1200, "Hazard Communication"
- OSHA 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories"

4.0 RESPONSIBILITIES

4.1 Product Line Management

Product line management is responsible for implementing processes for compliance with the CSIP in their respective areas, especially to ensure that their staff are properly trained and informed. A CSIP Compliance Checklist is attached as Appendix A for guidance in implementing the CSIP.

4.2 Safety and Health Representatives

- 4.2.1 The Safety & Health representatives are responsible for assisting line management with the development and implementation of the Chemical Safety Information Program. They also function as the Chemical Hygiene Officers (CHOs) and/or Hazard Communication Coordinators.

- 4.2.2 Safety & Health representatives in conjunction with line managers are also responsible for ensuring that program effectiveness is evaluated regularly and that changes are made based on the evaluation.

5.0 PROCEDURE

5.1 Material Safety Data Sheets (MSDSs)

- 5.1.1 MSDSs that are received for hazardous chemicals/materials are available from the MSDS coordinator, the Safety & Health representatives, and by accessing the TRIM system (<http://www.battelle.org/webtrimweb/>). In addition, the Occupational Health Services MSDS database is available to staff through the Battelle Technical Information Center (TIC) (<http://www.battelle.org/battelle/tic/resources/msds.msds>).

NOTE: Not all regional offices have access to the TIC database. Contact your Safety & Health representative for information on MSDSs.

- 5.1.2 The staff member purchasing a chemical is responsible for requesting an MSDS from the manufacturer of the item of purchase. For assistance, contact the appropriate Safety & Health representative or contact the MSDS coordinator.
- 5.1.3 If MSDSs are unavailable on new chemicals or new do not have an MSDS, staff should contact the chemical supplier or their respective Safety & Health representative.
- 5.1.4 If the HAZCOM standard applies, OSHA requires that an MSDS be available on-site for all hazardous chemicals used. Therefore, the staff member shall:
- 5.1.4.1 Manufacturer's contact their Manager/Supervisor or the Safety & Health representative, to obtain one.
 - 5.1.4.2 Not use the chemical until a MSDS can be located.
- 5.1.5 If the Lab Standard applies, the staff member shall notify the Safety & Health representatives so that he/she can ensure that precautions are identified, hazards are identified, and labels are appropriate.
- 5.1.6 MSDSs are received in a number of ways depending on the procedures of the supplier. If a staff member receives an MSDS directly from the supplier, he/she is responsible for sending a copy of the MSDS to the MSDS coordinator for the site. An additional copy should be sent to the BSLI Safety Health & Emergency Response (SHER) Office (Room 1219, King Annex.)
- 5.1.7 The BSLI SHER Office maintains a central file of MSDSs from the chemical suppliers for BSLI and will supply the most current MSDS available upon request.
- 5.1.8 Each non-laboratory area or section (including pilot plants) will maintain a central, accessible file of MSDSs for hazardous chemicals or substances used in its operation.

- 5.1.9 Each laboratory operation is encouraged to maintain a file of MSDSs for frequently used chemicals and hazardous chemicals.
- 5.1.10 Whenever a hazardous chemical is transferred (e.g., shipped) to another location, a MSDS must be included with the shipment or provided to the recipient before shipment. See Section 5.4.1.

5.2 Container Labeling

5.2.1 General Requirements

- 5.2.1.1 Original labels and inserts shall never be removed or defaced. Information on the label should include the name of the manufacturer or distributor, identity of the material, and hazard warnings.
- 5.2.1.2 When a chemical is dispensed from its original container into a secondary container, the secondary container must be labeled with at least the identity of the material.
- 5.2.1.3 Non laboratory operations (see Section 7.0 for definition) must include hazard warning(s) on the label for chemicals transferred from their original container (e.g., cylinders and reaction vials).
- 5.2.1.4 When a hazardous chemical is transferred (e.g., shipped) to another location, the label must identify the manufacturer, supplier, or responsible party, and must show any hazard warning(s) on the label. See Section 5.4.3.

5.2.2 Proprietary Container Marking

When contents of containers may not be identified due to proprietary or other reasons, the hazardous properties must be identified (e.g., corrosive, flammable, reactive nitrogen, etc.) and/or the container linked to a file record book by code or bar mark information as identified.

5.2.3 Waste Containers

All waste containers must be properly identified and labeled. Waste containers located at King Avenue and West Jefferson must be marked according to Environmental Procedures EN-GP-007, (Disposition of Chemical and Radioactive Waste and Spills). For other BSTI operations, contact your manager/supervisor for waste container labeling requirements.

5.3 Exposure Monitoring

- 5.3.1 When necessary, exposure monitoring will be conducted by SHIER staff or other qualified designees to determine compliance with OSHA permissible exposure limits (PELs) or with other applicable standards or guidelines (e.g., American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs)).

- 5.3.2 Within 15 working days of the receipt of the results, employees will be notified of the exposure measuring results in writing.¹

5.4 Hazard Determinations and Evaluation

- 5.4.1 BSHI will rely on the chemical manufacturer's MSDS for hazard determinations and evaluations.
- 5.4.2 When a manufacturer's MSDS is not available, other reference sources will be used as necessary.
- 5.4.3 When BSHI provides a hazardous chemical or material to one of its clients as a product or ships a hazardous chemical or material off site, an MSDS must be provided with the initial shipment of the material and when new data becomes available to the client or user. In addition, the label must identify the manufacturer, distributor, importer or responsible party, and must show any hazard warning(s) on the label.
- 5.4.4 The author of the BSHI MSDS shall provide an electronic version of the MSDS and a copy of all supporting documentation used to create the MSDS to the appropriate Safety & Health representative for review and authorization. The representative will then transmit the finalized generated MSDS to the appropriate person for inclusion into BSHI's internally generated MSDS file.

6.0 LABORATORY OPERATIONS

This section outlines the requirements that apply only to laboratory-scale operations. "Laboratory scale operations" means work with substances in which containers used for reactions, transfers, and other handling of substances are designed to be easily manipulated by one person. This definition generally excludes pilot plant operations.

6.1 Control Measures

Laboratory operations are subject to review by Safety & Health representatives and designed to ensure that the design of the work, and of the equipment can prevent accidents that could expose workers to hazardous chemicals or conditions (e.g., pressure build up, temperature excursions, etc.).

6.1.1 Engineering Controls

- 6.1.1.1 Hazardous chemicals, especially those that are volatile or are in gaseous state, generally must be used in a chemical fume hood.
- 6.1.1.2 Fume hoods must be maintained in proper working order. This is to be achieved in accordance with specific measures outlined in the Laboratory Hood Program, S01-GP-014.

¹Some chemical specific methods require written reporting.

6.1.2 Personal Protective Equipment (PPE)²

PPE, such as safety glasses with side shields, goggles, face shields, gloves, and aprons are required whenever there is a risk of direct chemical contact, especially for those chemicals where skin and eye contact are prohibited. A Personal Protective Equipment Hazard Assessment Certification is to be completed by the line manager in conjunction with the Safety & Health representative in accordance with SH-PP-001, Personal Protective Equipment Program.

6.1.1 Respiratory Protection

Respirator use will be required whenever a hazardous chemical is used and cannot be exhausted through chemical fume hoods or other ventilation and if use conditions will expose the worker to potentially hazardous concentrations of chemicals. The use, selection, medical evaluations, and fit testing are coordinated by the Safety & Health representative and the Health Services Department. The Respiratory Protection Procedure, SH-CP-010 covers in more detail the requirements for respiratory use as directed by OSHA's 1910.134.

6.2 Highly Hazardous Materials

6.2.1 The use of compounds that are highly hazardous, such as select carcinogens, reproductive toxins, and acutely toxic substances, requires the prior review by the Safety & Health representative.

6.2.2 These substances must be handled according to specific operating procedures, which may include designated area decontamination procedures, specific waste handling procedures, and PPE.

6.2.3 Recommended handling procedures for specific categories of chemicals are included in Appendix B. Consult the Safety & Health representative for assistance in categorizing the chemicals to use.

6.3 Medical Consultation

Medical consultation and surveillance through Health Services (814-424-6337) is available to all laboratory employees, especially if:

6.3.1 A staff member develops signs or symptoms believed to be associated with exposure to the hazardous chemicals;

6.3.2 Air monitoring data indicate that exposures are above recommended levels (e.g., PEL, Action Level);

6.3.3 An incident such as a leak, spill, or explosion occurs that results in a potential exposure or overexposure.

²See Personal Protective Equipment Program, SH-PP-001

7.0 NON-LABORATORY OPERATIONS

NOTE: See Appendix A for "Compliance Checklist"

This section outlines the requirements that apply to non-laboratory areas. Non-laboratory areas include field operations, pilot plants, machine shops, construction shops, and print shops that use, handle, or store hazardous chemicals. This does not apply to offsite and other areas that do not use, handle, or store hazardous chemicals.

7.1 Non-Laboratory Area General Requirements

- 7.1.1 List the hazardous chemicals present in the work area. Each group or department is responsible for keeping a current list of hazardous chemicals used in non-laboratory areas.
- 7.1.2 The list must be checked against the available MSDSs on file. If any MSDSs are missing, contact the chemical supplier or the Safety & Health representative.
- 7.1.3 All such work areas as ESHI must designate a staff member and chemical to be responsible for preparing and maintaining the list of chemicals.

7.2 Hazardous Non-Routine Tasks

- 7.2.1 Periodically, staff members are required to do hazardous non-routine tasks. Prior to working on such projects, supervisors are required to assure that each staff member is given appropriate on-site training as required by ESHI entry and health programs and as required by his/her supervisor or designer about any hazardous chemicals or processes to which they may be exposed while carrying out the non-routine task including:
 - 7.2.1.1 Information on the hazards of the chemical(s) to which they may be exposed.
 - 7.2.1.2 Protective equipment such as ventilation, respiratory protection, the presence of another staff member, written opening procedures, and emergency procedures that can be taken to prevent or reduce exposures.

- 7.3.2 Examples of hazardous non-routine tasks that might be performed by staff members include:

Task	Potential Hazards/Hazardous Chemicals
Confined Space Entry ¹	Oxygen deficiency; exposure to toxic materials, fire and explosion.
Work on New or Experimental Equipment ²	Stored energy; ³ Electrical, mechanical, pneumatic.
Chemicals in Unlabeled Pipes (Leak, Flushing Operations)	Hazardous chemicals and gases carried in the pipe.

7.3 Outside Contractor Personnel

- 7.3.1 The Safety & Health representative for Facilities will be the primary contact for contractors performing facilities related work contracted through BNFL Facilities Support Operations.
- 7.3.2 Operations and research staff and the supervisors of the areas where outside contractors work, share responsibility with the Safety & Health representative for Facilities to ensure that hazardous chemicals, potential hazards, and true safety precautions are identified and communicated to contractors.
- 7.3.3 Each Safety & Health representative is responsible for providing their respective outside contractors with the following:
- 7.3.3.1 Hazardous material information for the area.
 - 7.3.3.2 Precautions the contractor's personnel should take to lessen the possibility of exposure (e.g., the use of appropriate protective measures).
- 7.3.4 Outside contractors must adhere to the safety and health precautions specified in the contract and listed in the Health and Safety Procedures and Practices for Contractors, information sheet (for a copy, contact the BNFL SH&ER office).
- 7.3.5 If a contractor is found to be in violation of any safety regulations, the Safety & Health representative should be notified immediately.

¹ See Confined Space Program, 104-10-000.

² See Hazardous Energy Control Procedures, 104-10-000.

8.0 TRAINING

8.1 General HAZCOM and Lab Standard Training

Training required by the Lab Standard for general topics is performed for all laboratory staff and other appropriate staff as part of the new staff orientation process. This training includes but is not limited to:

- § 1.1 Comparison and content of the provisions of both standards including when each may apply
- § 1.2 Labeling requirements in laboratory situations versus non-laboratory situations
- § 1.3 The location and availability of Material Safety Data Sheets (MSDSs)
- § 1.4 Methods and observations to detect the release of hazardous chemicals in the workplace
- § 1.5 Physical hazards and health hazards of commonly encountered chemicals in the workplace including signs and symptoms associated with chemical exposures
- § 1.6 Measures that may be taken to minimize and/or eliminate exposures to hazardous chemicals, such as the development of appropriate work practices, the use of personal protective equipment, and review of emergency procedures

8.2 Specific HAZCOM and Lab Standard Training Requirements

- § 2.1 Refer to section 7.0, New Laboratory Operations, for situations requiring specific training under the Hazard Communication standard
- § 2.2 Details of individual laboratory operations vary by laboratory activity, and process. Therefore specific work practices and chemical hazard information are to be transmitted to the staff by their supervisors with assistance from the Safety & Health representative, as necessary, prior to the start of work in which the employee may be exposed to chemical hazards

9.0 PROGRAM REVIEW

In order to comply with the requirements of 29 C.F.R. 1910.1450, Occupational exposure to Hazardous Chemicals in Laboratories, the effectiveness of the RSTI Chemical Safety Information Program (CSIT) equivalent to the chemical hygiene plan) must be reviewed and evaluated at least annually and updated as necessary (reference 29 C.F.R. 1910.1450(e)(4)).

10.0 ASSOCIATED PROCEDURES

- Personal Protective Equipment Program SII-PP-001
- Hazardous Energy Control Program Plan SII-PP-101
- Hazardous Energy Control Procedure SII-LP-004
- Confined Space Program SII-PP-08
- Refrigerators Protection Procedure SII-GP-006
- Laboratory Hood Program SII-GP-014

- BCLD Operating Under 1340-1 Hazard Control- General
- Disposition of Chemical and Radioactive Waste and Spillout (EN-41P-007)

Appendix A: Compliance Checklist

Chemical Safety Information Program Compliance Checklist	
	Prepare a list of chemicals used in the work area. Laboratories should list the commonly used chemicals and before any new projects begin, add to the list as needed. Non-laboratory areas must list all chemicals or chemical products.
	Compare the chemical inventory list (non-laboratory areas only) against a list of the MSDSs in the work area to determine if any MSDSs are missing. If MSDSs are missing, immediately notify your supervisor, Safety & Health representative, or the chemical supplier to obtain a copy.
	Once the hazards of the chemicals are identified, specific safe work practices must be written.
	Staff must be trained and informed about the specific chemical hazards and written work practices before chemicals are handled and before any new chemicals or hazards are introduced into the work area.
	OSHA's New Staff Orientation classes on the OSHA PPE Standard, Chemical Safety Information Program, Emergency Action Plan, and Health Services Orientation are presented via the Battlec network. New Staff are notified electronically to inform them of the need to complete the Orientation. For more information, contact the training coordinator at 314-424-7149.
	Written procedures must detail how the institution will maintain a hazardous chemical inventory list, MSDSs, written work practices, and required staff training.

Appendix B: RECOMMENDED HANDLING PROCEDURES FOR HIGHLY HAZARDOUS CHEMICALS

1. Pre-names for additional employee protection for work with the following categories of substances shall be made:

- Select Carcinogens
- Reproductive Toxins
- Acute Toxic Substances
- Reproductive Hazards

(Leading precautions for other types of "highly hazardous" chemicals, such as Chemical Safety Materials, explosives, biohazard materials, and radioactive materials, are provided in specific operating procedures at BGS/UC. For more information on these materials, contact the respective Safety & Health representative.)

2. Use small quantities: Do not buy, store, transfer, or use amounts greater than necessary for the research work.
3. Keep the containers closed to the extent possible to prevent or minimize the release of chemicals through vaporization, spillage, etc.
4. Open and transfer hazardous chemicals and conduct research work inside ventilated rooms (chemical fume hoods, glove boxes, etc.) whenever possible.
5. Post signs in the area where the work is being conducted (e.g., "Authorized Personnel Only").
6. Implement procedures for the highly hazardous waste disposal.
7. In many instances, protective clothing, from superficial gloves up to and including aprons and respirators, may be required especially if work is being conducted outside of the chemical fume hood. See the Safety & Health representative for evaluation of the work process for the appropriate personal protective equipment.

APPENDIX D

FILE PROTECTION AND PREVENTION REQUIREMENTS

FIRE PREVENTION AND PROTECTION PLAN

This fire prevention plan was written to address the possible hazard associated with the underground storage tank pipe integrity testing effort. It includes a list of the major fire hazards, potential control measures, the types of fire suppression equipment appropriate to the control of fire, arrangements of responsibilities for maintaining the equipment and systems. It shall be read to local employees and emergency responders on the fire hazards, the materials and processes to which they are exposed, and the emergency evacuation procedures.

FLAMMABLE AND COMBUSTIBLE LIQUIDS

All storage handling and use of flammable and combustible liquids shall be in accordance with NFPA 30 NFPA 30A, or other applicable standards under the supervision of a qualified person. The primary source of flammable and combustible liquids associated with the pipe-integrity testing are from gasoline underground storage tanks and associated piping at the Site 04 testing station.

All sources of ignition shall be prohibited in areas where flammable and combustible liquids are stored, handled, and processed. Forbids **NO SMOKING, MATCHES, OR OPEN FLAME** signs shall be posted in all such areas during the testing procedures.

Fire Protection Requirements

Because the area of interest is an operational fueling/purchase station, most of these requirements have been implemented. However during the pipe testing activities, at least one portable fire extinguisher rated 2A-B-C will be present on site.

Personnel conducting the pipe testing shall avoid handling against any part of their clothing becoming contaminated with flammable or combustible fluids. They shall not be allowed to continue work if their clothing becomes contaminated and they must remove or wash down the clothing as soon as possible.

Ventilation adequate to prevent the accumulation of flammable vapors to hazardous levels shall be provided in all areas where flammable and combustible liquids are handled or used.

When flammable liquids are used or handled, provisions shall be made to promptly and safely dispose of leakage or spills. For disposing flammable and combustible liquids:-

- a. All pumping equipment used for the transfer of flammable and combustible liquids shall be listed by a nationally recognized testing laboratory or approved by and labeled or tagged in accordance with the Federal agency having jurisdiction, such as the DOT.
- b. Flammable liquid dispensing systems shall be electrically bonded and grounded. All fuel tanks, hoses, and containers of 5 gal (18.9 L) or less shall be kept in metallic contact while flammable liquids are being transferred. Transfer of flammable liquids in containers in excess of 5 gal (18.9 L) shall be done only when the containers are electrically bonded.
- c. Flammable or combustible liquids shall be drawn from, or transferred into, vessels, containers, or tanks within a building or outside only through a closed piping system from safety cans by means of a device designed fitting in the top, or from a container or portable tank, by gravity or pump, through an approved self-closing valve. Transferring by means of air pressure on the container or portable tank is prohibited.
- d. Areas in which flammable or combustible liquids are transferred in quantities greater than 5 gal (18.9 L) from one tank or container to another shall be separated from other operations by at least 25 ft (7.6 m) or a barrier having a fire resistance of at least 1 hour. Drainage or other means shall be provided to

erted spills. Natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapors at or below 10% of the lower flammable limit.

e. Dispensing units shall be protected against outdoor damage by suitable means and permanent dispensing units shall be securely locked in place.

f. Dispensing nozzles and devices for Class I liquids shall be listed.

g. Large liquid handling devices, small engines, and similar equipment shall either be listed while hot, these devices shall be listed only in well-ventilated rooms free of open flames or an open air wet shall either be listed or design buildings.

h. Dispensing devices shall be in all cases at least 20 ft (6.1 m) from any activity involving listed sources of ignition. 59.5.21

FIRST RESPONSE FIRE PROTECTION

Portable fire extinguishers shall be provided where needed, as specified in Table 59-4. Fire extinguishers shall be inspected monthly and maintained as specified in NFPA 10. Records shall be kept on a tag or label attached to the extinguisher, or an inspection check list maintained on file, or by an electronic method that provides a permanent record. The date the inspection was performed and the results of the process performing the inspection shall be recorded.

Approved fire extinguishers

a. Fire extinguishers shall be approved by a nationally recognized testing laboratory and labeled to identify the listing and listing organization and the fire test and performance standard that the fire extinguisher meets or exceeds.

b. Fire extinguishers shall be marked with their letter (class of fire) and numerical (relative extinguishing effectiveness) classification.

c. Fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents are prohibited.

d. Labeled as water shall not a mounting foam or gas (air/oil) water type portable extinguishers that are operated by inserting the extinguisher in liquid or gaseous or combustible pressure containing chemical reaction to expel the agent are prohibited.

Fire extinguishers shall be in a fully charged and operable condition and shall be readily placed, distinctly marked, and readily accessible.

When portable fire extinguishers are provided for employee use in the workplace, the employer shall provide training upon initial employment, and at least annually thereafter, in the following:

a. General principles of fire extinguisher use and the hazards involved with each type stage fire fighting to all employees; and

b. Use of the appropriate fire fighting equipment to those employees designated in an emergency action plan to use fire fighting equipment.

Approved fire blankets shall be provided and kept in conspicuous and accessible locations as warranted by the operations involved.

No fire shall be fought where the fire is in excessive danger of contact with employees; all persons shall be removed to a safe area and the fire area guarded against intrusion.

ATTACHMENT 3
HEALTH AND SAFETY FORMS

TAILGATE SAFETY MEETING FORM

Date _____ Time _____ Job Number _____

Client _____ Address _____

Site Location _____

Location of Gathering Area _____

Scope of Work _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

General Hazards _____

Physical Hazards _____

Special Equipment _____

Emergency Procedures _____

Regional _____ State _____ Assistance Plans _____

Regional Address and Phone _____

ATTENDEES

NAME PRINTED

SIGNATURE

Meeting Conducted by _____ Signed by _____

Site Safety Officer _____ Construction Manager _____

EXCLUSION/CONSTRAINTS/REDUCTION DONE LOG IN/LOG OUT

NAME & TIME LOG IN

NAME & TIME LOG OUT

Accident/Incident Analysis

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Signature of Investigator to complete the first and second questionnaires
and return all copies to Colonel GEM Representative
within 48 hours of the meeting date of questionnaire return date

[illegible]

Business Information Systems, 1998, 10(1), 1-12

Additional Information (Please use this area to provide any additional information that may be relevant to the review of the application.)		Supporting documents (Please list any documents that are submitted in support of the application.) (Please provide the name of the document and the date it was submitted.)			
1		1			
2		2			
3		3			
4		4			
5		5			
6		6			
7		7			
8		8			
9		9			
10		10			

1000

Category	Sub-category	Value	Unit
Energy consumption	Electricity	1000	kWh
	Gas	500	m ³
Water consumption	Water	1000	m ³
	Wastewater	500	m ³
Waste management	Waste	1000	kg
	Recycling	500	kg

Downloaded from <http://ajphaphysoc.org/> by guest on June 11, 2016

[illegible]

Accident/Incident Analysis

1000

Signature of Investigator to complete the first and second notifications
and return all copies to District DDM Representative
within 48 hours of the incident. Date of notification/return date

[illegible]

Business Information Systems, 1998, 10(1), 1-12

Additional Expenses (List in detail the expenses that are not from the and were in increasing earnings)		Dependent children living by May 15, 2018 (List children who lived with you in the household dependent in a foster care institution)	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	

1000

1. **Identifikasi Masalah**
 2. **Pengumpulan Data**
 3. **Penyusunan Laporan**
 4. **Pengujian**
 5. **Penyempurnaan**

Keywords: *workplace spirituality, organizational commitment, organizational trust, organizational identification, organizational citizenship behaviors, organizational deviance behaviors*

[illegible]

ATTACHMENT 3
DRILLING SAFETY GUIDE

INTRODUCTION

The organization where you work is concerned in your safety, not only when you are working on or around a drilling rig, but also when you are traveling to and from a drilling site, moving the drilling and tools from location to location on a site, or providing maintenance on a drilling or drilling tools. This safety guide is for your benefit.

Every drill crew should have a designated safety supervisor. The safety supervisor should have the authority to enforce safety on the drilling site. A supervisor's first safety responsibility is to listen to the safety directions of the safety supervisor.

Governmental Regulations

All local, state, and federal regulations and standards, presently in effect or effected in the future, take precedence over the recommendations and suggestions that follow. Government regulations will vary from country to country and from state to state.

The Safety Supervisor

The safety supervisor for the drill crew, manual crew, will be the drilling operator.

- The safety supervisor should monitor the "responsibility" the safety and the "inclusivity" to enforce safety to be a matter of their experience.
- The safety supervisor should be the leader in using proper personal safety gear and set an example in following the rules that are being enforced on others.
- The safety supervisor should enforce the use of proper personal/protective safety equipment and take appropriate correction action when proper personal/protective safety equipment is not being used.
- The safety supervisor should understand that proper maintenance of tools and equipment and general housekeeping on the drilling will provide the environment to promote and enforce safety.
- Before drilling is started with a particular drill, the safety supervisor must be assured that the operator (who may be the safety supervisor) has had adequate training and is thoroughly familiar with the drilling, its controls, and its regulations.
- The safety supervisor should suspect the drilling at least daily for structural damage from hoists and tools, proper tension on the cables, loose or missing guards or protective covers, fluid leaks, damaged hoses, and/or damaged pressure gauges and pressure relief valves.
- The safety supervisor should check and test all safety devices, such as emergency shutdown switches, at least daily and preferably at the start of a drilling shift. Drilling should not be permitted until all emergency shutdown and warning systems are working correctly. Do not wear, ground, bypass or remove an emergency device.

The safety supervisor should check that all gauges, warning lights, and a critical alarm are functioning properly and listen for unusual sounds when starting an engine.

The safety supervisor should ensure that all new drilling workers are provided with safe operating practices on and around the drilling and should provide each new drill rig worker with a copy of the organization's drilling or asbestos safety manual and, when appropriate, the drilling manufacturer's operation and maintenance manual. The safety supervisor should ensure that each new employee reads and understands the safety manual.

The safety supervisor should carefully instruct a new worker in drilling safety and observe the new worker's progress towards understanding safe operating practices.

The safety supervisor should observe the mental, emotional, and physical capability of each worker to perform the assigned work in a proper and safe manner. The safety supervisor should discuss any worker from the drill site whose mental and/or physical capabilities might cause injury to the worker or co-workers.

The safety supervisor should ensure that there is a first aid kit and a fire extinguisher on each drilling and on each stationary vehicle, and ensure that they are properly maintained.

The safety supervisor (and all supervisors and providers) should be well trained and capable of using first aid kits, fire extinguishers, and all other safety devices and equipment.

The safety supervisor should maintain a list of addresses and telephone numbers of emergency assistance near construction sites (e.g., police, hospital, etc.) and inform other workers of the drill site of the addresses and locations of the list.

Individual Protective Equipment

For most geotechnical, tunnel, and/or groundwater drilling projects, individual protective equipment should include a safety hat, safety shoes, safety glasses with side shields and chin strap, but a respirator, without loose ends, straps, draw strings or belts or otherwise uncomfortable features that might catch on some rotating or translating component of the drilling. Rings and jewelry should not be worn during a work shift.

Safety Hat, Goggles

Safety hats (and hats) will be worn by everyone working or visiting at or near a drilling site. All safety hats should meet the requirements of ANSI Z89.1. All safety hats should be kept clean and in good repair under the headband and crown straps properly adjusted for the individual drilling worker or visitor.

Safety Shoes or Boots

All drilling personnel and all visitors to the drill site observing drilling operations without their permission of the drilling should wear safety shoes or boots. All safety shoes or boots should meet the requirements of ANSI Z41.1.

Glasses

All drilling personnel should wear glasses for protection against cuts and abrasions, which could occur while handling wire rope on a cable and those contact with sharp edges and burrs on drill rods and other

drilling or sampling tools. All gloves should be clean fitting and not have large cuffs or loose ties that can catch or entangle or obstruct components of the drilling.

Safety Glasses

All drilling personnel should wear safety glasses with side shields. All safety glasses should have side shields and meet the requirements of ANSI Z87.1.

Other Protective Equipment

For some drilling operations, the environment or regulations may dictate that other protective equipment be worn. The management of the drilling operations and the safety supervisor must determine the requirement for such equipment jointly. Such equipment might include face or eye protection, or reflective clothing. Each drilling worker should be trained in doing so; protective when appropriate. When drilling is performed in a chemically or radiologically contaminated ground, special protective equipment and clothing may and probably will be required. The design and composition of the protective equipment and clothing should be determined as a joint effort of management and the client who requests the drilling services.

Housekeeping On and Around the Drilling

The first requirement for safe drill operations is that the safety supervisor understands and holds the responsibility for maintenance and "housekeeping" on and around the drilling.

Designated storage locations should be provided for drills bits, materials, and supplies so that tools, materials, and supplies can be systematically and safely handled without falling or falling on a member of the drill crew or a worker.

- Avoid placing or transporting tools, materials, or supplies on or on the mast, (horizontally) of the drilling.
- Bits, drill bits, reamers, augers, and smaller drilling tools should be securely stacked or cased in bins to prevent spreading, rolling, or sliding.
- Fasteners or other driving hardware should be placed in a safe location on the ground or be secured to prevent movement when not in use.
- Waste areas, platforms, walkways, scaffolding and other structures should be kept free of materials, debris and obstructions, and sub elements such as air hoses, or oil that could cause a worker to lose one's grip or otherwise hazardous.
- Controls, control cables, warning and operator lights, and hoses should be stored free of oil, grease, mud, etc.
- Gasoline should not be stored in any portable container other than a new, undrilled, and container with flame arrester in the fill spout and having the word "gasoline" inside written

Maintenance Safety

Drill maintenance will make drilling operations safer. Maintenance should be performed safely.

When safety glasses with side shields when performing maintenance on a drilling or on drilling tools

- Shut down the drilling engine to make repairs or adjustments to a drilling gun or bit, or to the firing or trigger gun or adjustments that can only be made with the engine running). Take precautions to prevent accidents by starting of an engine during maintenance by removing or tapping the ignition key
- Always block the vehicle or lower the leveling jacks or both, and set hand brakes before working under a drilling

When possible and appropriate, a driver will remove air or hydraulic systems, the drilling fluid system, and the air pressure systems of the drilling prior to performing maintenance. Reduce the drilling and operating systems to a "zero energy state" before performing any repairs. The operator must, when opening the plugs, valves, caps, and other pressure points and caps

- Do not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have had a adequate time to cool
- Never walk or sit on or near a fire tank
- Do not use gasoline or other volatile, flammable liquids as a cleaning agent on or around a drilling
- Follow the manufacturer's recommendations for applying the proper quantity and quality of lubricants, hydraulic oils, fluids, or fuels

Replace all caps, filler plugs, protective guards or panels, and high pressure hose clamps, chains or cables that have been removed for maintenance before returning the drilling to service

Safe Use of Hand Tools

There are almost an infinite number of hand tools that can be used on or around a drilling and its repair shops. One the most important rule of proper use. The following are a few specific and some general safety rules that apply to safe use of several hand tools often used on and around drill rigs

- When safety glasses with side shields and require all others around you to wear safety glasses when using a hammer
- When safety glasses with side shields and require all others around you to wear safety glasses when using a chisel
- Keep all tools in good and orderly stored when not in use
- Use wrenches on ends – don't use flats on ends
- Use screwdrivers with blades that fit the screw slot

When using a wrench on a tight nut, use some penetrating oil, use the largest wrench available so that for the nut, and when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands while in contact are firmly placed. Don't push or pull with one or both feet on the drilling or the side of a nut or pin or some other blocking off device. Always assume that you may lose your footing – check the place where you are pulling or using objects.

- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches should be well treated frequently to prevent an accumulation of dirt and grease that would otherwise build up and cause wrenches to slip.

When use pipe wrenches in place of a ratcheting device

Apply a shock and be alert when they too are readily worn.

Position your hands so that your fingers will not be crushed between the wrench handle and the ground or the platform when breaking a nut or pin on the ground or on the drilling platform, the wrench may slip or the joint may suddenly let go.

Cleaning the Work Area

When drilling, adequate site cleaning and leveling should be performed to provide a safe working area for the drilling and supply. Drilling should not be commenced when tree limbs, unstable ground, or site characteristics pose a hazard to all handling conditions.

Start up

- All drilling personnel and visitors are instructed to "stand clear" of the drilling immediately prior to and during starting of an engine.

Make sure all gear horns are as required, all heat levers are disengaged, all hydraulic levers are in the correct non-actuating position, and the clutch rope is set on the release before starting a drilling engine.

- That all engines are using the manufacturer's manual.

Safety during Drilling Operations

Safety requires the attention and cooperation of every worker and on-site visitor.

- Do not drive the drilling from hole to hole with the mast (drum) in the raised position.

Before raising the mast (drum), check for overhead obstructions.

- Before raising the mast (drum), ensure all drilling personnel both reception of the operator, and visitors are cleared from the area immediately in the rear and the side of the mast. All drilling personnel and visitors should be informed that the mast is being raised prior to raising it.

Before the mast (drum) of a drilling is raised and drilling is commenced, level, and stabilize the drilling with leveling jacks and bracing. The drilling should be re-

lowered if it settles after being set up. Lower the mast (horizontally) only when the leveling jacks are down, and do not raise the leveling jacks again until the mast (horizontally) is lowered completely.

- 10. When starting drilling operations, review machine limits the mast (horizontally) if required according to the drill manufacturer's recommendations.
- 11. The operator of a drilling rig will only operate a drilling rig from the controls. If the operator of the drilling rig must leave the area of the controls, the operator should shift the transmission controlling the drive drive into neutral and place the feed control lever in neutral. The operator should shut down the drill engine before leaving the vicinity of the drill.

Driving or dropping loads is not permitted. All loads should be carefully passed by hand between personnel or should be lowered.

Do not continue to climb, to average or other dangerous or chaotic conditions prior to starting work on a drilling or while on the job.

- 12. If it is necessary to drill within an area level area, make certain that exhaust fumes are exhausted out of the area. Exhaust fumes can be toxic, and some fumes can be detected by smell.
 - 13. Clean mud and grease from your boots before ascending a drill platform, and use handrails and ladders. Watch for slippery ground when descending from the platform.
 - 14. During freezing weather, do not touch any metal parts of the drilling with exposed flesh. The using of bare skin to metal can cause almost instantaneous frost.
- Draw all air and water lines and pumps when not in use if freezing weather is expected.
- Draw all mechanical handrails or otherwise precautions to prevent drilling riggers and/or workers, or anyone from stepping or falling into the hole. All open handrails should be removed, protected, or be drilled or adequately according to local or state regulations on a regular basis of the drilling project.
- 15. Do not "back around" within the vicinity of the drilling and tool as it supply may go around even when the drilling is shut down.

When using a ladder on a drilling rig, face the ladder and grasp either the rail rails or the rungs with both hands while ascending or descending. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hand line and a drill "hook" or a safety hook to pass or bring hand tools.

Be careful when lifting heavy objects

- Before lifting any object without using a hoist, make sure the load is within your personal lifting capacity. If a worker has a risk for excessive:
 - Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and straight while flexing a knee forward. Grasp the object firmly with both hands and stand steady and squarely while keeping your back vertical and straight. In other words, perform the lifting with the muscles in your legs, not with the muscles in your lower back.
 - If a heavy object must be moved some distance without the aid of machinery, keep your back straight and straight. Change direction by moving your feet, not by twisting your body.
 - Move heavy objects with the aid of hand carts whenever possible.

Drilling operations should be terminated during an electrical storm, and the complete crew should move away from the drilling.

Overhead and Ground Utilizers

The use of a drilling site within the vicinity of electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the employment crew. Minutely run checks, team, and crew checks.

- Locate, note, and emphasize all overhead and buried utilities on all boring location plans and boring assignment sheets.
 - When events of electrical power lines exist in or near a drilling site on project, consider all ways to be clear and dangerous.
 - Watch for sagging power lines before entering a site. Do not let power lines to pass underneath. Call the utility and ask them to lift or raise the lines or to stop (turn off) the power.
- Before using the drilling event (plan) you, a site in the vicinity of power lines, with completely covered the drilling. (Distance what the minimum distance from any points on the drilling to the nearest power line will be when the mast is raised while being used.) Do not raise the mast or operate the drilling if the distance is less than 17 ft (5.1 m), or if lesser, the minimum distance stipulated by federal, state, and local regulations.
 - Keep in mind that both bare lines and overhead power lines can be moved toward each other by the wind.
- Move the drilling with the mast (boom) down to a real contact with power lines.
 - If there are any questions concerning the safety of drilling on site in the vicinity of overhead power lines, call the power company. The power company will provide expert advice on the drilling site as a public service and also cost.

Underground electricity is as dangerous as overhead electricity. Be aware and always respect the existence of underground utilities such as electrical wires, gas, petroleum, telephone, sewer and water. Ask for assistance.

- If a sign warning of underground utilities is located on a site boundary, do not assume that utilities and utilities are buried near, near the boundary or property line under the sign, call the utility and check it out. The underground utilities may be considerably distant away from the warning sign.
- Always contact the owners of utility lines on the nearest underground utilities before work begins drilling. Determine possible utility personnel the precise location of underground utility lines, mark existing the locations, and determine jointly with utility personnel what specific precautions must be taken to ensure safety.

Result to Contact with Electricity

If a drilling makes a contact with electrical wires, it may or may not be suitable if from the ground by the time of the contact. Under other circumstances, the human body, if it accidentally comes in a contact with the drilling and the ground will provide a conductor of the electricity to the ground. Both an electric injury can be the result. If a drilling or a drilling error makes contact with overhead or underground electrical lines:

- Under most circumstances, the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. Do not move or touch any part, particularly a metallic part, of the vehicle or the drilling.
- If it is determined that the drilling should be vacated, then all personnel should jump clear and as far as possible from the drill. Do not step off, jump off, and do nothing onto the vehicle in any part of the drill when jumping clear.

If you are on the ground, you should stay away from the vehicle and the drilling, do not let others get near the vehicle and the drilling, and make requests from local emergency personnel such as the police or a fire department.

Safe Use of Wire Line Hoists, Wire Ropes and Hoisting Hardware

The use of wire line hoists, wire ropes, and hoisting hardware should be as regulated by the American Iron and Steel Institute Wire Rope Users Manual.

All wire ropes and fittings should be visually inspected before use and thoroughly inspected at least once a week for abrasion, broken wires, worn sheaves, or rope diameter reduction, or wire diameter, fatigue, corrosion, damage from heat, rope jamming, poisoning, cracking, bird aging, bending, rope protrusion, and damage to lifting hardware. Wire ropes should be regularly inspected to determine excessive damage according to the Wire Rope Users Manual. All wire ropes that have not been used for a period of a month or more should be thoroughly inspected before being returned to service.

End fittings and connections consist of updated eyes and various manufactured devices. All manufactured end fittings and connections should be certified according to the manufacturer's instructions and is subject according to the manufacturer's specifications.

If a level handling type handling device is used to handle drill rods, an overhead arrangement should be supported and lubricated daily to ensure that the rods freely rotate under load.

If a steel slapping device is used to handle drill rods, do not drill through or contact drill rods through the slapping device. Do not let it more than 1 foot (30 cm) of the drill rod extend above the top of the case (chamber). Do not back a rod or hammer with force tool points, and do not make up, tighten, or loosen tool joints while the rod is being supported by a rod slapping device. If drill rods should slip back into the chamber, do not attempt to break the fall of the rods with your hands or by tampering with the slapping device.

Most, but not all, explosives drillings are stationary with single part line. The tension of parts of line should not ever be increased without first consulting with the usual sector of the drilling.

Wire ropes must be properly matched with each shaver – if the rope is too large, the shaver drill push the wire rope – if the rope is too small, it will groove the shaver. Once the shaver is grooved, it will severely pinch and damage larger sized wire rope.

The following practices and good maintenance is required to avoid explosions and safe use of wire rope handling hardware:

Use level handling device only for vertical lifting of tools (except when single hole drilling). Do not use level handling device to pull on a pipe curve from the drill rig. However, drills may be curved using the crane hook if the wire rope is specified through proper the wire are used in the assembly, have no considerations.

When slack tools or cables are to be moved with a hoist, disconnect the hoist line and connect the slack tools directly to the fixed mechanism of the drill. Do not use hydraulic breaking point for a drill pull to the hoist line or the fixed mechanism of the drill.

When attempting to pull out a curved down vehicle or drilling center, only use a wrench on the front or rear of the vehicle and stay as far as possible away from the wire rope. Do not attempt to use tool joints to pull out a curved down vehicle or drilling center.

Minimize shock loading of a wire rope by applying loads smoothly and steadily.

Avoid sudden loading or a wild no other.

Never use broken ropes.

Protect wire rope from sharp corners or edges.

Replace broken guides and rollers.

Replace worn sheaves or wheels, the wire bearings.

Know the safe working load of the equipment and tools being used. Always record this limit.

Periodically inspect and test anchors and breaks of hoists.

Know and do not exceed the rated capacity of hoists, cranes, lifts, jacks, and other lifting aids.

- Always wear gloves when handling wire rope.

Do not guide wire rope on hoist drums with your hands.

- Following the installation of a new wire rope, don't lift a light load to determine the wire rope is tight.

Never use any winch hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.

Never leave a load suspended in the air when the hoist is unattended.

Keep your hands away from hoist wire rope, hoisting device, the wire and push points as slack is being taken up, and when the load is being hoisted.

- Never lean on the load, over the load, body, or feet of any person.

- Never use a hoist line to "brake" up the mast structure of a derrick.

- Replace wire ropes with ones that conform to the drilling manufacturer's specifications.

Safe Use of Cathead and Rope Blocks

The following safety provisions should be employed when using a cathead hoist.

Keep the cathead clean and free of rust and oil under grease. The cathead should be cleaned with a wire brush if it becomes rusty.

Check the cathead periodically, when the engine is running, or rope cover grooves. If a rope groove shows to a depth greater than 1/8 inch (3 mm), the cathead should be replaced.

- Always use a clean, dry, steel rope. A wet or oily rope may "grab" the cathead and cause difficulty or other cause to be equally be used to the top of the mast.

Don't let the rope "grab" the cathead or otherwise become caught in the drum, or in the rope and avoid an appropriate alarm for all persons living safely back away and stand clear. The operator should also back away and stand clear. If the rope "grabs" the cathead, and it is not located in the groove at the top of the mast, the rope will often break, releasing the load. If the rope does not break, stay clear of the drill and the operator must make certain to turn off the drilling engine and appropriate alarm is taken to release the hoist. The operator should be up enough back on the suspended cable and should quickly back away after turning off the engine.

Never let a rope down contact with all elements. Check also for loose deterioration of the rope that may not be readily detectable.

Never wrap the rope from the cathead or any other rope, wire rope or cable on the drilling) around a hand, wrist, arm, foot, cable leg, or any other part of your body.

Always maintain a minimum of 10 inches of clearance between the operating hand and the railroad track when driving a sleeper, using an other tool only like a wheel and rope method. Be aware that the rope is directed toward the railroad with a roll hammer. Know as the sleeper or other drilling tool advances into the ground.

- Never operate a railroad for purposes any other task around a drilling with loose, unbalanced, or otherwise unbalanced loading or when using gloves with large cuffs or loose straps or buckles.

Do not use a rope that is any longer than one meter. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.

Do not use more rope wraps than are required to have a lead.

Do not leave a critical attachment with the rope wrapped on the track.

- Position all other hand lines to prevent contact with the operating railroad rope.

When using the railroad shanks for driving or backdriving, make sure that all threaded connections are tight and clear as far away as possible from the hammer impact point.

- The railroad operator must operate the railroad shank(s) in a level surface with good firm footing conditions without distraction or disturbance.

Safe Use of Augers

The following general precautions should be used when starting a boring with a reference flight or ball or start auger:

Before to start an auger boring with the drilling level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low revolutions per minute:

- Apply an adequate amount of down pressure prior to rotation to seat the auger head in the ground surface.

Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.

- Handle inside the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below ground surface.

- Use the auger guide to facilitate the steering of a straight hole through hard ground in a permanent.

The operator and toolhandler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger returns, and mounting and removing the auger hole. The operator must ensure that the toolhandler is well away from the auger's chain, and that the auger hole is secured before starting rotation.

Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tool during rotation.

When you finish to use the auger to handle sugar sections

- When you place hands or fingers under the bottom of an auger section when heaving the auger over the top of the auger section in the ground or other hard surface such as the drilling platform.

Never allow feet to get under the auger section that is being heaved.

When rotating augers, stay clear of the rotating auger and other rotating components of the drilling. Never reach behind or around a rotating auger for any reason whatever.

- Use a long handled shovel to move auger sections away from the auger. Never use your hands or feet to move sections away from the auger.

Do not remove earth from rotating augers. Augers should be cleaned only when the drilling is in neutral and the auger is not stopped from rotating.

Safety During Rotary And Core Drilling

Rotary drilling tools should be safety checked periodically and replaced when necessary

- Water hoses and hoisting cable should be lubricated and checked for "fracture" bearings before use.

Drilled check pins should be checked periodically and replaced when necessary.

The operation of hoists and the crew should be checked against the anticipated weight to be drilled using pins after inspection hoisting loads.

Special precautions that should be taken in safe rotary or core drilling are the checking, joint loads, hoisting and lower of drilled pins.

Only the operator of the drilling should touch or set a manual check on the rotation of the check without being prior to recovering the section from the hole.

- Drilled pins should not be loaded during lowering into the hole with drilled check pins.

Drilled pins should not be hoisted or lowered into the hole with gas wrenches.

- The string of drilled pins are not to be hoisted or inadvertently released into the hole, an attempt should not be made to catch the falling pins with your hands or a wrench.

In the event of a plugged hole or other circulation blockage, the high pressure in the pump and lines between the pump and the obstruction should be released or let down before handling the last test joint.

When drill rods are hoisted from the hole, they should be clamped or pinched before handling with a pulley or other suitable tool or pin. Do not use your hands to close drilling flasks from drill rods.

- If work must progress over a poorly drilling fluid formation, no one should attempt to raise or remove rods or cross members. The mud pit should be equipped with rough surfaced, fixed cover panels of adequate strength to hold drilling personnel.
- Drilling should not be started until a satisfactory mud column has been formed. After providing some method of securing the upper ends of the drill bit returns for safe material storage or for the mud column.

Safety During Travel

The vehicle driver transports a drilling rig, and all a drilling site should:

- Be properly licensed and should only operate the vehicle according to Federal, state, and local regulations.

Know the mass (weight), height (provided a hammer), width, length, and weight of the drilling with a crane or derrick leg, and height, width, and weight of the truck and vehicle, making sure these limits are not exceeded with an adequate margin.

Do not move a drilling unless the road is broken out or around working order.

- Allow for most overloading when maneuvering or approaching other vehicles or structures.
- Be aware that the capacity of service stations and roads is not often as low for a drilling unit as it is with the most in the travel industry.

Watch for low hanging overhead lines, particularly at the entrance to drilling site, restaurants, hotels, or other commercial sites.

When traveling a street, road, or highway with the most (height) of the drilling in the road or partially loaded position.

- Remove all signs, keys when a drilling is left unattended.

Loading and Unloading

When loading or unloading a drilling rig on a trailer on a track

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the drilling with corner, or before loading.
- Load and unload on level ground.
- Use the assistance of some one on the ground as a guide.

Check the brakes on the drilling carrier before approaching loading ramps.

Distribute the weight of the drilling, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the hitch of the pulling vehicle. Refer to the trailer manufacturer's weight distribution or recommendations.

- Secure drilling and tools to the hauling vehicle with two chains, and/or lead binders of adequate capacity.

Off Road Movement

The following safety suggestions relate to off-road movement.

- Before moving a drilling, walk the route of travel, inspecting for depressions, obstructions, gullies, ruts and weather conditions.

Always check the brakes of a drilling carrier before traveling, particularly on rough, uneven, or hilly ground.

Check the complete drive train of a carrier at least weekly for loose or damaged belts, pins, shafts, and coverings.

- Disengage all powertrain before moving a drilling on rough or hilly terrain.
- Engage the front axle (for 4x4, 4x6, 6x6, etc.) vehicles or carriers when traveling off highway or hilly terrain.
- Use caution when traveling side hill. Conservatism is evaluated side hill capability of drill rigs, because the voluntary addition of drilling tools may raise the center of mass. When possible, travel downhill is desirable. Turn on the processor before traveling on hilly terrain (do not use elevated tire pressure).
- Do not attempt to cross obstacles such as small logs and small erosion channels or ditches at an angle.
- Use the assistance of someone on the ground as a guide when traveling overhead clearance is close.

After the drill has been moved to a new drilling site, set all features under lock. When
grinding the strap, hold the handle.

- When there is a drill with the most elements of the drill rig in the most or any other case of
position.

Time, Weather and Fuel

Time on the drilling rig must be checked daily for safety and during a scheduled travel for less of an and they must
be maintained under repair in a safe manner. If time is defined to reduce ground pressure for use in
on soft ground (the time should be as follows) it is correct pressure before movement on firm or hilly ground or
on streets, roads, and highways. Under inflated tires are not safe to use on ground as properly inflated
tires. Air pressure should be maintained for travel on streets, roads, and highways according to the
manufacturer's recommendations. During air pressure checks, inspect for:

- Missing or loose wheel legs
- Clamps wedged between wheels or embedded in the tire casing
- Damage to or poorly fitting tires or tire flanges
- Abnormal or uneven wear on tires, tread, or tires in the casing

The repair of truck seal-off highway tires should only be made with repair of special tools and following the
recommendations of a tire manufacturer's repair manual.

Water is critical, strong is, if. The vehicle is critical when using water batteries.

Water batteries are installed and which require safety glasses with side shields.

When a battery is removed from a vehicle or service unit, disconnect the battery ground
cable first.

- When installing a battery, connect the battery ground cable last.
- When charging a battery with a battery charger, turn off the power source to the battery
before either connecting or disconnecting charger leads to the battery posts. Cables
should be loosened prior to charging to prevent the escape of gas.
- Spilled battery acid can burn your skin and damage your eyes. Some acids that's spilled
battery acid off of your skin with lots of water. Should battery acid get into someone's eyes,
flush immediately with large amounts of water and see a medical physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight that on
open flames to check electrolyte levels, ensure that the positive post is covered or covered,
and avoid creating sparks around the battery by shorting wires or battery terminals. Keep
lighted smoking materials and flames away from batteries.

Significant persons must be taken for handling fuel and refueling the drilling or service.

Only use the type and quality of fuel recommended by the engine manufacturer.

Refuel in a well-ventilated area.

- Do not fill fuel tanks while the engine is running. Turn off all electrical switches.
- Do not spill fuel on hot surfaces. Clean any spillage before starting an engine. Wipe up spills of fuel with cotton rags or cloths – do not use wood or synthetic cloths.
- Keep open lights, lighted smoking materials, and flames or smoking equipment away from the fueling area.

Turn off engines or burner tanks when refueling the burner or the drilling.

Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.

Keep the fuel nozzle in a container with the tank being filled to prevent static sparks from igniting the fuel.

- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
- Keep fuel containers well away in contact with a metal surface during travel to prevent the buildup of static charge.

First Aid

At least one volunteer of the drill crew, preferably the drilling safety supervisor, should be trained to perform first aid. First aid is taught on a person-to-person basis, not by providing or reading a manual. Manuals should only provide emergency responses and be used for reference. It is suggested that courses provided or sponsored by the American Red Cross or a similar organization best satisfy the requirements of first aid training for drill crew.

For drilling operations, it is particularly important that the volunteer(s) available for first aid be able to recognize the symptoms and provide first aid for electrical shock, heart attack, stroke, broken bones, eye injury, major lacerations, and cuts or lacerations to the skin. Again, first aid for these conditions is best taught to drill coordinators by instructors qualified by an agency such as the American Red Cross. A first aid kit should be available and well-stocked on each drill site.

Drill Rig Maintenance

Do not attempt to repair manufacturers' ratings of speed, torque, pressure, flow, etc. Only use the drill rig and tools for the purposes that they are intended and designed.

Drill Rig Alterations

Alterations to a drilling or drilling tool should only be made by qualified personnel and only after consultation with the manufacturer.

DRILLING EQUIPMENT			
Contract Name and Number:		Contract/Job/Reference:	
Government Inspector:		Location:	
Contractor Supervisor:		Date:	
Representative and number:			
		Tra	Sta
1. Is a copy of the manual for a drilling equipment available? (18-M-52)			
2. Are a survey, bench, submersible, slotted, level and a level of benches and potential ground benches and their locations identified in the site layout plan? (18-M-53)			
3. Does the bench/level/level contain copies of Material Safety Data Sheets for all drilling fluids available? (18-M-54)			
4. Have all members of the drilling crew been trained on the operation, inspection, and maintenance of the equipment, the safety features and procedures for use it, and conducted a formal line analysis for general hazards? (18-M-54)			
5. Does the drilling equipment have two easily accessible emergency shutdown devices (one for the operator and one for the helper)? (18-M-55)			
6. Is there a pressure control with a warning of a critical hazard? (18-M-56)			
7. Indicate a system or an electrical pressure warning device available to ensure safe distances from power lines are maintained? (18-M-56)			
8. Before moving with drilling equipment, has the travel route been surveyed for overhead and from a bench, particularly overhead a level of benches? (18-M-57)			
9. Is equipment set up on a stable surface, grade, leveling, if necessary? (18-M-58)			
10. Are outriggers required in accordance with the manufacturer's instructions? (18-M-59)			
11. Are drill/recessions prohibited from moving, from a lifting, jacking, or equipment that might become caught in moving machinery? (18-M-60)			
12. Are steps being taken to control, limit? (18-M-61)			
13. Are steps taken only when the rotating mechanism is operational for the steps or stopped? (18-M-62)			
14. Where shall be provided to guard against employee contact with steps (guard around the steps, bench side around the perimeter of the steps, electrical bench extended by a pressure warning device)? (18-M-63)			
Comments:			

ATTACHMENT 4
MATERIAL SAFETY DATA SHEETS



1.1 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSI INFORMATION
SYSTEMS, INC.

1101 Macfarlane Road, Suite
300

Madison, TN 37017-1402

1-813-389-2000

EMERGENCY TELEPHONE
NUMBER

1-800-424-6300 (NORTH
AMERICA)

1-700-327-0897
(INTERNATIONAL)

SUBSTANCE: GASOLINE, AUTOMOTIVE, UNLEADED

TRADE NAME/STOCK #S:

UNLEADED GASOLINE PREMIUM UNLEADED GASOLINE PETROL MOTOR SPORTS
ROMEX GASOLINE 94-GRADE GASOLINE 90-GRADE GASOLINE UNLEAD GASOLINE
87-90 UNLEADED

CHEMICAL FAMILY: petroleum hydrocarbons

CREATION DATE: April 11, 1995

REVISION DATE: May 20, 2000

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: GASOLINE, AUTOMOTIVE, UNLEADED

CAS NUMBER: 8006-618

EC NUMBER (GHS): 202-349-1

PERCENTAGE: 100

COMPONENT: KEROSENE

CAS NUMBER: 71-43-2

EC NUMBER (GHS): 200-753-7

PERCENTAGE: <1

3. HAZARDS IDENTIFICATION

HPTA RATINGS (SCALE 1-4): HEALTH=3 TOXIC=3 REACTIVITY=3

EMERGENCY OVERVIEW:

ODOR: colorless to amber

PHYSICAL FORM: volatile liquid



ODOR: faintest color

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, cancer hazard (in humans)

PHYSICAL HAZARDS:Extremely flammable liquid and vapor Vapor increases flash fire

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation, coughing in the nose, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, drowsiness, disorientation, difficulty speaking, blood swings, loss of coordination, blurred vision, bilateral pupils or pinpoint pupils, lung congestion, kidney damage, liver damage, effects on the heart, coordination, unconsciousness, coma.

LONG TERM EXPOSURE: changes in body temperature, changes in blood pressure, nausea, loss of appetite, difficulty breathing, irregular heartbeat, headache, dizziness, drowsiness, sleep disturbances, mood swings, loss of coordination, hearing loss, visual disturbances, muscular weakness, blood clots, kidney damage, liver damage, reproductive effects, heart damage, cancer.

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation, blisters, changes in blood pressure, stomach pain, blood clots, heart damage, kidney damage, liver damage, effects on the heart.

LONG TERM EXPOSURE: irritation, blisters, skin discoloration, ingrown, irritation.

EYE CONTACT:

SHORT TERM EXPOSURE: irritation, visual disturbances

LONG TERM EXPOSURE: irritation, eye damage

INGESTION:

SHORT TERM EXPOSURE: changes in body temperature, nausea, vomiting, diarrhea, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, drowsiness, disorientation, mood swings, tremors, loss of coordination, blurred vision, blood skin color, lung congestion, lung damage, internal bleeding, paralysis, convulsions, unconsciousness, coma, aspiration hazard.

LONG TERM EXPOSURE: reproductive effects, cancer.

CARCINOGEN STATUS:

OSHA: Yes

NTP: Yes

IARC: Yes

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

RESECTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. The vapor is heavier than air. Vapors can cause asphyxiation at distant system sources and flash back. Vapors can migrate into explosion

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam.

Large fire: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. Fire lines in camp or storage area. Cool containers with water from unmanned hose held or on remote monitor until well after fire is out. If this is impossible then take the following precautions: If appropriate, people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising gas or falling safety device or any indication of tank fire to fire. For tank, end on tank track. Evacuate area within 300 meters (1/2 mile). Water may be ineffective.

FLASH POINT: 40 F (-40 C) (CC)

LOWER FLAMMABLE LIMIT: 1.2%

UPPER FLAMMABLE LIMIT: 7.4%

AUT-IGNITION: 550-600 F (280-300 C)

FLAMMABILITY CLASS (NFPA): 2

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1990 (Proposition 65). Keep out of water supplies and streams.

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Stay back if possible without personal risk. Refrain to open with water spray small spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Take for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to 100 U.S. GARA Section 304). If release occurs in the U.S. and is not visible under CERCLA Section 103, notify the National Response Center at (800) 424-9303 (USA) or (202) 546-2675 (USA).

7. HANDLING AND STORAGE

STORAGE Store and handle in accordance with all current regulations and standards. Subject to storage regulations. U.S. OSHA 29 CFR 1910.106. Containing and handling required. Use original container for storage recommendations. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS

GA-BOLINE, AUTOMOTIVE, UNLEADED

GA-BOLINE OSHA HANDBOOK

300 ppm (300 mg/m³) OSHA TWA (revised by 50 FR 20030 June 20 1985)

300 ppm (300 mg/m³) OSHA STEL (revised by 50 FR 20030 June 20 1985)

300 ppm ACGIH TWA

300 ppm ACGIH STEL

NIOSH recommended TWA (lowest feasible concentration)

BENZENE

1 ppm OSHA TWA

3 ppm OSHA STEL 15 minutes

0.5 ppm OSHA action level

10 ppm OSHA TWA (applies to industry except from benzene standard 1910.1000)

25 ppm OSHA ceiling (applies to industry except from benzene standard 1910.1000)

50 ppm OSHA peak 10 minutes (applies to industry except from benzene standard 1910.1000)

0.5 ppm ACGIH TWA (idms)

2.5 ppm ACGIH STEL (idms)

0.1 ppm NIOSH recommended TWA 10 hours

1 ppm NIOSH recommended STEL

DYE MARK (instantaneous absorption larger)

0.25 mg/m³ (0.25 cc/l) ACG TWA (effective 1 Jan 2003 no longer valid per amendment)

0.25 mg/m³ (0.25 cc/l) OEL TWA (idms) (BIOLOGY)

1 ppm UK WEL TWA (idms)

MEASUREMENT METHOD Chemical tube; Carbon disulfide- Gas chromatography with flame ionization detection, NIOSH ID #1000 Hydrocarbon, ALCO #3700 #1004

VENTILATION Ventilation equipment should be implemented if employee concentration of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION Wear splash resistant safety goggles with a chemical shield. Provide an emergency eye wash location and quick drench shower in the immediate work area.

CLOTHING Remove any chemical coated clothing immediately. Wear appropriate chemical resistant clothing.

GLOVES Wear appropriate chemical resistant gloves.

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is needed in and/or from concerns to customers. Consider wearing protection before use.

Any chemical catalytic respirator with organic vapors or cartridges.

Any chemical catalytic respirator with a full facepiece and organic vapor cartridge(s).

Any air-purifying respirator with a full facepiece and an organic vapor cartridge.

For Unknown Concentrations or Immediately Dangerous to Life or Health –

Any supplied air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

5. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOR: colorless to amber

PHYSICAL FORM: volatile liquid

ODOR: fishhook odor

BOILING POINT: 120-122 F (39-24 C)

FREEZING POINT: Not available

VAPOR PRESSURE: Not available

VAPOR DENSITY (air=1): 2.9-4.0

SPECIFIC GRAVITY (water=1): 0.7-0.8

WATER SOLUBILITY: insoluble

PH: Not available

VOLEATILITY: Not available

ODOR THRESHOLD: 200 ppm

EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: absolute alcohol, ether, chloroform, benzene

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressures

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: oxidizing materials

GASOLINE AUTOMOTIVE UNLEADED

CONDITIONS (STRONG): Fire and explosion hazard.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of carbon.

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

GASOLINE, AFTONOTIVE, UNLEADED

IRRITATION DATA

300 mg/24 hours / skin-rabbit-act

TOXICITY DATA

150 mg/kg oral-rat-LD50 15400 mg/kg oral-rat-LD50 >5 mg/kg skin-act-rat LD 5 mg/kg/2 weeks/d intraperitoneal-rat rat TCLo 10 mg/kg/4 weeks/d intraperitoneal-rat rat TCLo 4 mg/kg/25 hours x 140 days/d intraperitoneal-rat rat TCLo 3000 mg/kg/50 weeks/d intraperitoneal-rat rat TCLo

CARCINOGEN STATUS DATA Human In Vitro/In Vivo Evidence Animal Limited Evidence Group 2B

ACUTE AD: Animal Carcinogen

In studies with mice and rats by inhalation, an increased incidence of hepatocellular adenomas and carcinomas was produced in female but not male mice; an increased incidence of adenomas and carcinomas of the kidney was produced in male but not female rats

LOCAL EFFECTS

Irritation: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Exposure Time: ingestion

TARGET ORGANS: central nervous system

TUMORIGENIC DATA

1500 ppm inhalation-rat TCLo/70 weeks/d continuous, 3000 ppm inhalation-mouse TCLo/60 hours/d-70 weeks/d intermittent, 3000 ppm inhalation-rat TC/60 hours/d-70 weeks/d intermittent

ADDITIONAL DATA: Administer may enhance the toxic effects. Stimulants such as epinephrine may enhance ventricular fibrillation

Toxicity and irritation data derived from unspecified and unleaded gasoline

BENZENE

IRRITATION DATA

15 mg/24 hours / open skin-act-rat-LD 30 mg/24 hours / skin-act-rat-mouse 80 mg eyes-act-rat-mouse 1 mg/24 h. rat / open-act-rat-mouse

TOXICITY DATA

2 g/kg/2 months/d inhalation-human LCLo 30 mg/kg oral-rat LCLo 350 ppm/d 7 weeks/d intraperitoneal-rat mouse TCLo 100 ppm inhalation-human TCLo 80 mg/kg/20 years/d inhalation-human LCLo 104 mg/kg intraperitoneal-rat-LDLo 100 mg/kg oral-rat-LD50 10000 ppm/7 hours/d inhalation-rat-LD50 1100 mg/kg intraperitoneal-rat-LD50 4700 mg/kg oral-mouse LD50 2000 ppm inhalation-mouse LC70 60 mg/kg skin-rat, rat LD50 340 mg/kg intraperitoneal-mouse LD50 3 mg/kg oral-day LCLo 140000 mg/kg/d inhalation-day LCLo 170000 mg/kg/d inhalation-rat LCLo 40000 ppm/20 months/d inhalation-rat LCLo >2400 mg/kg skin-act-rat-LD50 80 mg/kg intravenous-act-rat-LDLo >4000 mg/kg skin-passive-pig LD50 527 mg/kg intraperitoneal-passive-pig LCLo 1400 mg/kg intravenous-day LCLo 2700 mg/kg oral-mouse/LD50 10000 ppm/20 months/d inhalation-mouse LCLo 1000 mg/kg intraperitoneal-mouse LCLo 5 mg/kg intravenous-rat-LDLo 600 mg/kg/12 hours/d oral-mouse TCLo 4000 ppm inhalation-rat TCLo 10000 ppm inhalation-rat LCLo 25000 ppm/22 weeks/d inhalation-act-rat LCLo 0.1 mg/kg intramuscular-act-rat-LDLo 1 mg/kg oral-rat-LD50 1000 mg/kg oral-rat-LD50 15 mg/kg/7 hours/d inhalation-mouse LCLo 107 ppm/20 hours/d inhalation-rat TCLo 50 mg/kg/20 hours/d inhalation-human TCLo 75 mg/kg/20 hours/d inhalation-human TCLo 2 g/kg/2 months/d inhalation-human LCLo 5 mg/kg/20 hours/d inhalation-human LCLo 0.7 mg/kg oral-human LCLo 2000 ppm/20 months/d inhalation-mouse TCLo 2000 ppm/20 months/d inhalation-mouse TCLo 1 ppm/60 hours/d inhalation-rat TCLo 6000 mg/kg/22 weeks/d intraperitoneal-rat rat TCLo 20 mg/kg/24 hours/d-40 days/d intraperitoneal-rat rat TCLo 500 ppm/60 hours/d-12 weeks/d intraperitoneal-rat rat TCLo 300 ppm/60 hours/d-20 weeks/d intraperitoneal-rat rat TCLo 17 mg/kg/17 weeks/d

intermittent oral rat TDLo: 1600 ppm/2 hours/2-3 weeks/1 intermittent subcutaneous rat TCLo: 300 ppm/6 hours/2-3 weeks/1 intermittent subcutaneous rat TCLo: 12 ppm/kg/5 weeks/1 intermittent subcutaneous rat TDLo: 16 mg/kg/21 days/1 intermittent subcutaneous rat TDLo: 3187 mg/kg/3 days/1 intermittent subcutaneous rat TDLo: 15005 mg/kg/12 weeks/1 intermittent subcutaneous rat TDLo: 5 mg/kg/10 days/1 intermittent subcutaneous rat TDLo: 4250 mg/kg/17 weeks/1 intermittent subcutaneous TDLo: 300 ppm/6 hours/2-10 weeks/1 intermittent subcutaneous rat TCLo: 20 ppm/6 hours/2-8 days/1 intermittent subcutaneous rat TCLo: 14 ppm/6 hours/2-10 weeks/1 intermittent subcutaneous rat TCLo: 10 ppm/6 hours/2-20 weeks/1 intermittent subcutaneous rat TCLo: 211 ppm/6 hours/2-7 days/1 intermittent subcutaneous TCLo: 300 ppm/6 hours/2-24 weeks/1 intermittent subcutaneous rat TCLo: 40 ppm/6 hours/2-14 days/1 intermittent subcutaneous rat TCLo: 2187 mg/kg/3 days/1 intermittent subcutaneous rat TCLo: 160 ppm/6 hours/2-72 weeks/1 intermittent subcutaneous rat TCLo: 500 mg/kg/20 hours/2-13 weeks/1 intermittent subcutaneous rat TCLo: 100 ppm/6 hours/2-3 weeks/1 intermittent subcutaneous rat TCLo: 225 mg/kg/8 weeks/1 intermittent subcutaneous rat TCLo: 222.4 mg/kg/7 days/1 intermittent subcutaneous rat TCLo: 4000 mg/kg/5.4 days/1 intermittent subcutaneous rat TCLo: 7.5 mg/kg/12 weeks/1 intermittent subcutaneous rat TCLo: 100 ppm/6 hours/2-3 weeks/1 intermittent subcutaneous rat TCLo: 1172 mg/kg/12 weeks/1 intermittent subcutaneous rat TCLo: 100 ppm/2 weeks/1 intermittent subcutaneous rat TCLo: 125.5 mg/kg/5.4 days/1 intermittent subcutaneous rat TCLo: 24.50 mg/kg/2 days/1 intermittent subcutaneous rat TCLo: 20 ppm/6 hours/2-14 days/1 intermittent subcutaneous rat TCLo: 100 ppm/6 hours/2-14 days/1 intermittent subcutaneous rat TCLo:

CARCINOGEN POTENTIAL: CSHA: Carcinogen, NTP: Known Human Carcinogen, IARC: Human Sufficient Evidence, Annual Sufficient Evidence Group 1, ACDIS: A1 -Confirmed Human Carcinogen, EC Category 1: TCM 305 K 1

Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased risk of leukemia for exposure to benzene. But causal exposure patterns and poorly defined exposures make these interpretations difficult. Three independent cohort studies have demonstrated an increased incidence of acute myelopharyngeal leukemia in workers exposed to benzene.

LOCAL EFFECTS

Irritant: irritation, skin, eye

ACUTE TOXICITY LEVEL

Highly Toxic: dermal absorption

Moderately Toxic: ingestion

Slightly Toxic: inhalation

TARGET ORGANS: nervous system/blood / central nervous system.

MECHANICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, immune system-based on or allergies.

TOXICOKINETIC DATA

300 mg/kg subcutaneous rat TCLo/70 weeks/1 intermittent, 10 ppm subcutaneous human TCLo/6 hours/2-10 weeks/1 intermittent, 32 ppm/kg oral rat TDLo/2 weeks/1 intermittent, 1200 ppm subcutaneous rat TCLo/6 hours/2-10 weeks/1 intermittent, 1000 mg/kg oral mouse TDLo/2 years/1 intermittent, 300 ppm subcutaneous mouse TCLo/6 hours/2-18 weeks/1 intermittent, 1200 ppm skin mouse TDLo/80 weeks/1 intermittent, 100 mg/kg subcutaneous mouse TDLo/6 weeks/1 intermittent, 600 mg/kg subcutaneous mouse TDLo/77 weeks/1 intermittent, 170 mg/kg peritoneal mouse TDLo/10 weeks/1 intermittent, 100 ppm subcutaneous human TCLo/6 months/2-4 years/1 intermittent, 50 ppm/kg oral rat TDLo/1 year/1 intermittent, 10 ppm/kg oral rat TDLo/2 weeks/1 intermittent, 800 mg/kg subcutaneous mouse TCLo/1 year/1 intermittent, 750 ppm subcutaneous mouse TCLo/1 year/1 intermittent, 1500 ppm subcutaneous mouse TCLo/6 hours/2-10 weeks/1 intermittent, 2400 mg/kg oral mouse TDLo/1 year/1 intermittent, 8 ppm subcutaneous human TCLo/1 weeks/1 intermittent, 10 mg/kg subcutaneous human TCLo/1 years/1 intermittent, 300 ppm subcutaneous mouse TCLo/6 hours/2-18 weeks/1 intermittent, 51500 mg/kg oral rat TDLo/100 weeks/1 intermittent, 100000 mg/kg oral rat TDLo/100 weeks/1 intermittent, 1.2573 mg/kg oral rat TDLo/100 weeks/1 intermittent, 1.2573 mg/kg oral mouse TDLo/100 weeks/1 intermittent, 51500 mg/kg oral mouse

TDL&TCC results : contaminated

MUTAGENIC DATA

metabolism in mammalian systems : *Salmonella typhimurium* 10 ppm < 8300 spontaneous revertants ; *Drosophila melanogaster* after oral 11200 revert./cell, see chromosome loss and non-disjunction ; *Drosophila melanogaster* after oral 7300 ppm, see chromosome loss and non-disjunction ; *Drosophila melanogaster* multiple 37500 ppm, mutation in mammalian systems : *Saccharomyces cerevisiae* 540 mg/L (400) pure chromosome and nuclear recombination ; *Saccharomyces cerevisiae* 370 mg/L, see chromosome loss and non-disjunction ; *Aspergillus nidulans* 30000 ppm, other mutation test systems : *yeast* epistasis inhibition 14 ppb (2 hours) ; other mutation test systems : non-mammalian species interspersed 70 ppb/lyc DNA inhibition : human lymphocyte 1200 revert./cell, DNA inhibition : human Hela cell 1200 revert./cell, other mutation test systems : human lymphocyte 3 revert./cell, cytogenetic analysis : human inhibition 120 ppm (1 week) ; cytogenetic analysis : human lymphocyte 1 revert./cell, 72 hours (1) ; cytogenetic analysis : human lymphocyte 1 mg/L, cytogenetic analysis : human transported 10 ppm 4 weeks (1) ; water chromosomal exchange : human lymphocyte 300 revert./cell, mutation in mammalian somatic cells : human lymphocyte 1 ppb, micronucleus test : rat inhibition 1 ppm 6 hours (1) ; water chromosomal DNA synthesis : rat liver 1 revert./cell, DNA inhibition : rat inhibition 400 ppm, other mutation test systems : rat liver 1 revert./cell, other mutation test systems : rat liver marrow 1 revert./cell, other mutation test systems : rat leukocytes 1 ppb, other mutation test systems : rat leukocytes 1200 mg/kg, cytogenetic analysis : rat inhibition 300 mg/kg (2 weeks) ; cytogenetic analysis : rat leukocytes 2400 mg/kg (2 days) ; chromosomal, cytogenetic analysis : rat interspersed 24 mg/kg, cytogenetic analysis : rat oral 10000 mg/kg, water chromosomal exchange : rat inhibition 3 ppm (1) ; water chromosomal exchange : rat lymphocyte 1 revert./cell, micronucleus test : mouse erythro 1200 revert./cell, micronucleus test : mouse leukocytes 440 mg/kg, micronucleus test : mouse oral 40 mg/kg, micronucleus test : mouse interspersed 304 mg/kg (24 hours) ; micronucleus test : mouse inhibition 10 ppm (2 hours) ; mutation in mammalian systems : mouse lymphocyte 12000 mg/L (400) mutation in mammalian systems : mouse erythro 2000 mg/L (400) morphological transformation : mouse erythro 1 ppb, morphological transformation : mouse fibroblast 150 mg/L, DNA damage : mouse lymphocyte 2400 revert./cell, DNA at 1 day : mouse interspersed 304 mg/kg (2 days) ; mutation after mutation test systems : mouse oral 3 ppm (1) ; other mutation test systems : mouse other cell types 5 revert./cell, DNA inhibition : mouse oral 30 mg/kg, other mutation test systems : mouse lymphocyte 10 revert./cell, DNA inhibition : mouse interspersed 304 mg/kg, DNA inhibition, mouse inhibition 3000 ppm 4 hours (1) ; continuous DNA inhibition : mouse bone marrow 3 revert./cell, water chromosomal exchange : mouse inhibition 10 ppm (1) ; water chromosomal exchange : mouse interspersed 5 mg/kg, cytogenetic analysis : mouse oral 30 mg/kg, cytogenetic analysis : mouse interspersed 204 mg/kg (3 days) ; continuous, cytogenetic analysis : mouse inhibition 3000 ppm, chromosome break test : mouse oral 1 mg/kg, chromosome break test : mouse interspersed 5 mg/kg, mutation in mammalian somatic cells : mouse lymphocyte 12000 mg/L, mutation in mammalian somatic cells : mouse inhibition 40 ppb (6 weeks) ; continuous mutation in mammalian somatic cells : mouse oral 3 ppm (2 days) ; continuous in morphological transformation : hamster embryo 100 mg/L, DNA damage : hamster embryo 17 revert./cell, cytogenetic analysis : hamster liver 250 mg/L, cytogenetic analysis : hamster embryo 100 mg/L, water chromosomal exchange : hamster embryo 700 mg/L, see chromosome loss and non-disjunction : hamster liver 12000 mg/L, see chromosome loss and non-disjunction : hamster embryo 30 revert./cell, mutation in mammalian somatic cells : hamster embryo 12 revert./cell, DNA damage : adult inhibition 2400 mg/kg, DNA inhibition : adult inhibition 2 ppm (1) ; other mutation test systems : adult liver marrow 1 revert./cell, other mutation test systems : rat liver marrow 1 revert./cell, cytogenetic analysis : adult inhibition 2400 mg/kg, DNA damage : mouse interspersed 3000 mg/kg, DNA damage : mouse oral 3000 mg/kg, micronucleus test : mouse inhibition 10000 ppm (3 weeks) ; cytogenetic analysis : mouse liver 5 ppm (1) ; morphological transformation : mouse fibroblast 0.01 mg/L (20-21 days) ; cytogenetic analysis : micronucleus 7.5 mg/kg (2 weeks) ; mutation test : micronucleus test : interspersed 0.03 mg/kg, micronucleus test : interspersed 0.03 mg/kg, micronucleus test : non-mammalian species multiple 10 mg/L (26 hours) ; micronucleus test : non-mammalian species multiple 10 mg/L (50 minutes) ; DNA add test : mouse interspersed 3000 mg/kg (3 days) ; chromosomal,

reproductive test: mouse inhalation 100 ppm/6 hours/14 weeks/sterile test; mouse skin test: mouse inhalation 500 ppm/2 weeks/14 weeks/sterile test; DNA adduct: rat skin peritoneal 0.5 mg/kg/1 day/si

REPRODUCTIVE EFFECTS DATA

470 mg/kg inhalation-rat TCLe24 hours/11 days/1 per pregnancy/110 days/1 pregnant female continuous: 5000 mg/kg inhalation-rat TCLe24 hours/110 days/1 pregnant female continuous: 50 ppm inhalation-rat TCLe24 hours/17-14 days/1 pregnant female continuous: 150 ppm inhalation-rat TCLe24 hours/17-14 days/1 pregnant female continuous: 1 mg/kg oral mouse TDLo 6-15 days/1 pregnant female continuous: 12 mg/kg oral-mouse TDLo 6-15 days/1 pregnant female continuous: 4000 mg/kg oral mouse TDLo 6-12 days/1 pregnant female continuous: 10000 mg/kg oral mouse TDLo 6-15 days/1 pregnant female continuous: 500 ppm inhalation-mouse TCLe7 hours/16-15 days/1 pregnant female continuous: 500 mg/kg inhalation-mouse TCLe72 hours/16-15 days/1 pregnant female continuous: 5 ppm inhalation-mouse TCLe 6-15 days/1 pregnant female continuous: 20 ppm inhalation-mouse TCLe6 hours/16-15 days/1 pregnant female continuous: 5 mg/kg intraperitoneal mouse TDLo 1 day/1 male: 200 mg/kg intraperitoneal mouse: TDLo 14 days/1 pregnant female continuous: 1100 mg/kg intraperitoneal mouse TDLo 12 days/1 pregnant female continuous: 7000 mg/kg intraperitoneal-mouse TDLo 12-13 days/1 pregnant female continuous: 10000 mg/kg intravenous-mouse: TDLo 13-16 days/1 pregnant female continuous: 4 mg/kg parental mouse TDLo 12 days/1 pregnant female continuous: 1 mg/kg inhalation-male TCLe24 hours/17-20 days/1 pregnant female continuous: 1 mg/kg inhalation-male TCLe24 hours/17-20 days/1 pregnant female continuous: 500 ppm inhalation-male TCLe7 hours/16-15 days/1 pregnant female continuous

ADDITIONAL DATA: May cause the placenta. Altered may enhance the toxic effects. Interactions with drugs may occur. Wounds such as squamous may not use various Le fibroblasts.

HEALTH EFFECTS

INHALATION

ACUTE (A POSSIBLE)

GASOLINE/AUTOMOTIVE UNLEADED: At 100-200 ppm blood methionine may occur within several hours. At 2000 ppm mild anesthesia may occur within 30 minutes. Other symptoms of acute nervous system depression may include headache, nausea, vomiting, dizziness, drowsiness, facial flushing, blurred vision, slurred speech, difficulty swallowing, staggering, confusion and euphoria. At higher levels dyspnea, pulmonary edema and bronchopneumonia may develop. Further depression may occur with weak respiration and pale, convulsive twitching, irritability and coma. Severe intoxication may result in delirium, unconsciousness, coma, and convulsions with apneustic spasms. The pupils may be constricted or in dilatation states. Head and tilted or retracted, mydriasis may also occur. May also affect the liver, kidneys, spleen, lungs, myocardium and pancreas. Death may be due to respiratory or circulatory failure or metabolic acidosis. Extremely high concentrations may cause asphyxiation.

BENZENE: Concentrations of 2000 ppm may cause respiratory tract irritation, more severe exposures may result in pulmonary edema. Systemic effects are mainly on the central nervous system and depend on exposure time and concentration. No effects were noted at 20 ppm for 6 hours. Signs of intoxication began at 50-150 ppm within 3 hours at 500-1500 ppm, within 1 hour at lower rates at 7500 ppm, within 30-60 minutes and 20-300 ppm was fatal within 3-10 minutes. Effects may include nausea, vomiting, headache, dizziness, drowsiness, weakness, sometimes preceded by a brief period of exhilaration or euphoria, irritability, malaise, confusion, coma, staggering, weak rapid pulse, chest pain and tightness with bronchospasm, pallor, cyanosis of the lips and fingertips and fingers. In severe exposures there may be bluish veins, shallow rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor paralysis, tremors and hyperreflexia, sometimes preceded by convulsions. Recovery depends on the severity of exposure. Polyneuropathy may occur and there may be persistent nausea, vomiting, muscular weakness, headache, drowsiness, unconsciousness, and agitation. Nervous irritability, bronchospasm and cerebral edema may persist for 2-3 weeks. A peculiar skin color and cardiac

systems may persist for 4 weeks. Liver and kidney effects may occur, but are usually mild, temporary symptoms. Chromosomal damage has been found after exposure to toxic levels. Although generally hematotoxicity is not a significant concern in acute exposure, delayed hematological effects including anemia and thrombocytopenia, have been reported as have petechial hemorrhages, spontaneous internal bleeding and secondary infections. In fatal exposures, death may be due to asphyxia, central nervous system dysfunction, cardiac or respiratory failure and circulatory collapse, or occasionally sudden myocardial infarction. Death may occur within a few minutes to several hours, or sometime anytime, may occur at anytime within 24 hours. Also, death from central nervous system respiratory or hematologic complications may occur up to 8 days after exposure. Pathologic findings have included respiratory inflammation with edema and hemorrhage of the lungs, renal congestion, central edema, and extensive petechial hemorrhage in the brain, pleura, pericardium, urinary tract, mucous membranes and skin.

CHRONIC EXPOSURE

CASOLINE AUTOMOTIVE UNLEADED With few exceptions most of the reported effects of repeated inhalation are from intentional "tuffing" of gasoline rather than workplace exposure. Reported symptoms include headache, nausea, fatigue, weakness and weight loss, pallor, decreased awareness, memory loss, nervousness, confusion, muscular weakness and cramps, peripheral neuropathy, polyuria, and anemias. It is unclear whether some of these symptoms may have been due to gasoline containing lead. Liver and kidney damage are also possible. In a 90 day study made but not finished it is indicated a certain dose-related renal toxicity. In another study an increase in renal tubular and proximal tubule cells and an increase in hepatocellular chromatin and necrosis in female mice were reported.

FINDINGS Long-term exposure may cause symptoms attributable to the central nervous, hematopoietic and immune systems. Early effects on vision and visual and may include headache, light-headedness, dizziness, nausea, anorexia, abdominal discomfort, and fatigue. Seen, dry throat, weakness, lethargy, anorexia, decreased responsiveness, and irritability have also been reported. Later there may be dyspnea, pallor, slightly increased temperature, decreased blood pressure, rapid pulse, polyuria, and renal disturbances. Dizziness when cold water is placed in the ear and hearing impairment have been reported as have diffuse cerebral atrophy associated with ataxia, tremor and emotional lability. Workers exposed to benzene in combination with other solvents have exhibited polyuria. Several case reports, one of them an acute exposure, suggest the possibility that chronic exposure may be associated with leukoeliasis or optic neuritis. Occasionally hemorrhages in skin and conjunctiva occur and rarely myocardial infarction and papilledema have accompanied the initial hemorrhages. Hematological effects vary widely and may appear after a few weeks or many years of exposure or even many years after exposure has ceased. The degree of exposure below which no blood effects will occur cannot be established with certainty. In the early stages there may be blood clotting defects due to morphological, functional and quantitative platelet alterations with associated bleeding from the nose and gums, easy bruising and petechiae, leukopenia with predominant lymphocytopenia or neutropenia, and anemia which may be normochromic or microcytic and hypochromic. External albuginea hemorrhages, splenomegaly, circulating immature marrow cells, and an initial increase in leukocytes, erythrocytes and platelets have also been reported. The bone marrow may be hyper-lytic or normolytic and does not always correlate with the peripheral blood picture. Also, the symptoms do not always parallel the laboratory findings. If treated at this stage, the effects appear reversible, although recovery may be protracted and there may be relapse. Decreased erythrocyte survival, hemolytic, regenerative (highly regenerative) hemoglobin, iron metabolic disturbances and hypochromemia have also been reported. Exposure to high levels for longer periods may result in aplasia and fatty degeneration of the bone marrow with pancytopenia. The most serious form of aplastic anemia may be fatal due to hemorrhage and infection. Death may occur within 3 months of diagnosis. Excessive vulnerability to individual exposure including dose-dependent aplasia, and the finding of neutrophilia suggests that, in some cases, the blood dyscrasias may partially be an allergic reaction. Human case reports and studies have suggested a relationship between exposure to benzene and the

occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure-potential and poorly defined exposure render these interpretations difficult. Three independent cohort studies have demonstrated an increased incidence of acute myelophthocytic leukemia in workers exposed to benzene. Several studies have also reported a link between occupational exposure and myeloid leukaemia and lymphoma, both Hodgkin's and non-Hodgkin's. Although aplastic anemia is probably the most likely consequence of long-term exposure, it is not uncommon for an individual progressing from the so-called "proliferative phase" into leukaemia. Generally, leukemia without preceding aplastic anemia can occur. In one study the range of time from the start of the exposure to the diagnosis of leukemia was 3-24 years. It has been suggested that the chromosomal alterations which can occur in peripheral blood and bone marrow cells and persist for a long time after exposure to benzene may be associated with the increased incidence of leukemia. The immunosuppressive effect has also been suggested as being associated with the leukemogenesis. Adverse effects on the immunological system have been shown to make subjects more susceptible to tuberculosis and pneumonia and may explain why the terminal event in some cases of benzene intoxication may be overwhelming infection. Reported case-control studies have shown a tendency toward an excess of lymphoid neoplasms. Both solid and increased incidence of neoplasms, namely carcinomas, at various sites. Hemorrhagic diathesis have been reported more frequently in exposed women. Testicular damage has been reported in rats, rabbits and guinea pigs. Some animal studies have demonstrated endocrinopathogenic, sometimes adverse at low as 10 ppm and the potential for teratogenic effects such as decreased body weight and skeletal variants have also been shown. Other studies have not produced any demonstrable endocrinopathogenic or cytotoxicity.

SKIN CONTACT

ACUTE EXPOSURE

CASOLINE, AUTOMOTIVE UNLEADED Liquid may cause irritation with erythema and pain. Prolonged or intensive contact may cause blistering and, on extensive areas epidermal necrosis. A 12 year old boy partially immersed in a pool of gasoline for 1 hour experienced hyperemia, abnormal tenderness, hyperemated intra-vascular coagulation, transient hemolysis, necrotic skin lesions and an elevated serum enzyme. Acute myeloid cerebral edema, diffuse bilateral pneumonia, interstitial cardiac infarction, toxic nephritis, fatty infiltration of liver and periparturition fat necrosis.

BENZENE Direct contact may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and edema. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. It may however contribute to the toxicity from inhalation. A 1000 ppm to guinea pigs resulted in increased dermal permeability.

CHRONIC EXPOSURE

CASOLINE, AUTOMOTIVE UNLEADED Repeated or prolonged contact with the liquid may cause irritation, dermatitis and depletion of the skin with drying and cracking or fissures and blistering. Some individuals may develop hypersensitivity, probably due to aldehydes.

BENZENE Repeated or prolonged contact with the skin may result in dermatitis with erythema, scaling, dryness, vesiculation, and fissuring, generally accompanied by paraesthesia of the fingers which may persist several weeks after the dermal irritation. Perforated sores have also been reported. Secondary infections may occur. Data on guinea pigs indicate sensitization is possible. Although animal studies have failed to establish a relationship between skin contact and a carcinogenic effect, most of the studies were inadequate. Some papillomas and hemangioendothelial effects have been reported.

EYE CONTACT

ACUTE EXPOSURE

CASOLINE, AUTOMOTIVE UNLEADED Concentration between 270 and 900 ppm may cause a

symptoms of irritation often before signs such as conjunctival hyperemia are visible. Local irritation to the eyes may cause pain, watering and slight, increased corneal epithelial disturbance. High-conc. and conjunctival hyperemia and edema may occur.

HUMAN DATA: May cause irritation. V. poor recommendations of 2000 ppm are may irritation even on local exposure. Dry-plate cause a moderate burning sensation, but only a slight, increased corneal epithelial injury with rapid recovery.

CHRONIC EXPOSURE

CASOLINE, AUTOMOTIVE UNLEADED: Repeated or prolonged exposure may cause eye irritation and possible gradual, irreversible loss of corneal and conjunctival sensitivity.

HEXAMINE: Repeated or prolonged exposure may cause conjunctivitis. In one study 50% of rats exposed to 50 ppm for more than 600 hours developed catarrh.

INGESTION

ACUTE EXPOSURE

CASOLINE, AUTOMOTIVE UNLEADED: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause irritation and burning of the gastrointestinal tract with nausea, vomiting and diarrhea. Absorption may cause initial central nervous stimulation followed by depression. Symptoms may include a mild irritation, reflexive nervousness, irritability, twitching, weakness, blurred vision, headache, dizziness, drowsiness, loss of action, confusion, delirium, unconsciousness, convulsions and coma. Cardiac arrhythmias may occur. Transient liver damage is possible. Types of pulmonary involvement may include coughing, dyspnea, sublethal pain, malaise, development of rapid breathing, cyanosis, tachypnea and fever. Even small amounts may be fatal with death caused by cardiac arrest, asphyxia or respiratory paralysis. Depending on amount aspirated, death may occur rapidly or within 24 hours.

HEXAMINE: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause local irritation and burning sensation to the mouth, throat and stomach, and hemorrhagic necrosis of the mucous membranes in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, headache, dizziness, weakness, rigidity, chest pain and lightness, shallow rapid pulse and respiration, incontinence, pallor followed by flushing and a loss of respiratory drive. There may be neural disturbances, tetanic convulsions, ventricular arrhythmias, and paralysis. Excitement, asphyxia or delirium may precede weakness, fatigue, dyspnea and followed by stupor and unconsciousness, coma and death from respiratory failure. Those who survive the central nervous system effects may develop bronchitis, pneumonia, pulmonary edema, and inter-pulmonary hemorrhage. The usual lethal dose in humans is 10-15 milliliters. Intracardiac amounts have been reported to cause death. A single exposure may produce long-term effects with paratyphoid pneumonia setting up in a year.

CHRONIC EXPOSURE

CASOLINE, AUTOMOTIVE UNLEADED: No data available.

HEXAMINE: Daily administration to humans of 2-8 grams as clear oil caused headache, vertigo, bladder irritability, myalgia, gastric disturbances, and evidence of renal compensation. In female rats treated with 100 mg/kg daily doses over 187 days, no effects were observed at 10 mg/kg. There was slight leukopenia at 10 mg/kg and both leukopenia and anemia were seen at 50 and 100 mg/kg. Oral administration to rats and mice at various dose levels induced respiratory alkalosis when 20 mg/kg and 50 mg/kg. In a one-year garage study rats given 50 or 200 mg/kg 4-5 days/week for 52 weeks did not exhibit signs or behavior



toxic effects, but a dose-related increase of leukocytes and monocyte counts was observed. These were other toxic types also reported. Reproductive effects have been reported in animals.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: US: EPA 40 CFR 261 Hazardous Waste Manifest(s) DOT: Hazardous Waste Manifest(s) GHS: Disposal of Hazardous Waste US: EPA 40 CFR 261 for concentrations also shown for Regulatory level; Regulatory level: 0.5 mg/L

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101

PROPER SHIPPING NAME: Gasoline

UN NUMBER: UN1202

HAZARD CLASS/DIVISION: 3

PACKING GROUP: II

LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS

SHIPPING NAME: Gasoline

UN NUMBER: UN1202

CLASS: 3

PACKING GROUP/ENVIRONMENTAL GROUP: 3

LAND TRANSPORT ADR

PROPER SHIPPING NAME: Gasoline

UN NUMBER: UN1202

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: I

LABEL: 3

LAND TRANSPORT RID

PROPER SHIPPING NAME: Gasoline

UN NUMBER: UN1202

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: I

LABEL: 3

AIR TRANSPORT IATA

PROPER SHIPPING NAME: Gasoline

UNION NUMBER: UN1000
CLASS OR DIVISION: 3
HAZARD CLASS: 3
PACKING GROUP: 0

AIR TRANSPORT HAZ
PROPER SHIPPING NAME: *Gasoline*
UN NUMBER: UN1000
CLASS OR DIVISION: 3
CLASS: 3
UN PACKING GROUP: 0

NAUTIME TRANSPORT HAZ
PROPER SHIPPING NAME: *Gasoline*
UN NUMBER: UN1000
CLASS OR DIVISION: 3
PACKING GROUP: 0

15 REGULATORY INFORMATION

FEDERATIONS

FEDERAL SECTION 100-103 HAZARDOUS SUBSTANCES (40 CFR 100-10)
Reactive: 15 LHS NO

SAHA TITLE 40 SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 304.304)
Not regulated.
SAHA TITLE 40 SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 304.40)
Not regulated.

SAHA TITLE 40 SAHA SECTION 301/312 HAZARDOUS CATEGORIES (40 CFR 301.302)
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SLUDGED RELEASE: No

SAHA TITLE 40 SECTION 303 (40 CFR 303.304)
Reactive:

OTHER PROCESS SAFETY (CPC PROHIBITION): *Not regulated*

STATE REGULATIONS

California Proposition 65

Exposure to the state of California to cause the following
Reactive:

Cancer (Feb 27 1987)

Developmental toxicity (Dec 26 1987)

Male reproductive toxicity (Dec 26 1987)

CANADIAN REGULATIONS**WHISKY CLASSIFICATION:** Not determined**EUROPEAN REGULATIONS****EC CLASSIFICATION (AMBER RED)**

Yes	Harmful
	Category: Category 2

EC Classification may be inconsistent with independently researched data.

DAVID BUREAU ZALIS (TM) (1)**EC RISK AND SAFETY PHRASES**

R 45	May cause cancer
R 65	Harmful: may cause long damage if swallowed
R 65	In case of accidental or if you feel unwell, seek medical advice immediately (show the label where possible)
R 73	A real exposure: obtain special instructions before use

CONCENTRATION LIMITS**COMPONENT R 45/65****COMPONENT R 45****NATIONAL INVENTORY STATUS****U.S. INVENTORY (TSCA):** Listed as a priority**TSCA 1306 EXPORT NOTIFICATION:** Not listed**16 OTHER INFORMATION****MSDS SUMMARY OF CHANGES****EXPLOSIVE CONTROLS PERSONAL PROTECTION**

©Copyright 2019-2020 MSDS Information Systems Inc. All rights reserved



1.2 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**MSD INFORMATION SYSTEMS
INC.**

1301 Macintosh Road, Suite 200
Buckville, TN 37027-3020
1 615 390-3000

**EMERGENCY TELEPHONE
NUMBER**

1 800-424-9000 (NORTH AMERICA)
1 703-527-3867 (INTERNATIONAL)

SUBSTANCE: DIESEL FUEL NO. 2

TRADE NAME/IDENTIFIER

DIESEL OIL, DIESEL FUEL, DIESEL OIL, MEDIUM FUELS, DIESEL NO. 2, DIESEL OIL, NO. 2,
DIESEL FUEL OIL NO. 2-D, DIESEL FUEL NO. 2-D, NO. 2 DIESEL FUEL, WINTER DIESEL, CHEVRON
DIESEL FUEL NO. 2, ARCO DIESEL/ARCO PRODUCTS COMPANY 1 DIESEL FUEL #2, REGULAR
DIESEL FUEL OIL #2, CALCO SPECIAL LF DIESEL OIL, SECURCO DENTHCO

CHEMICAL FAMILY: petroleum hydrocarbon

CREATION DATE: Mar 14 1995

REVISION DATE: Jan 16 2005

2. COMPOSITION INFORMATION ON INGREDIENTS

COMPOUND: DIESEL FUEL NO. 2

CAS NUMBER: 8007-34-6

EC NUMBER (EINECS): 270-870-1

EC INDEX NUMBER: 610-027-00-2

PERCENTAGE: 100

OTHER COMPONENTS:

May contain trace amounts of sulfur, ash and 2-ethylhexanol

3. HAZARDS IDENTIFICATION

SDS RATING SCALE: H=6, HEALTH=C, FUEL=C, REACTIVITY=6

EMERGENCY OVERVIEW

CGHDS: solution to known

PHYSICAL FORM: liquid

ODS: petroleum color

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, central nervous system depression

PHYSICAL HAZARDS: Flash back hazard, Combustible liquid and vapor

POTENTIAL HEALTH EFFECTS

IRRADIATION:

SHORT TERM EXPOSURE irritant, severe, varying headache symptoms of dizziness, drowsiness, blood-red color eyes.

LONG TERM EXPOSURE no information on significant adverse effects

SKIN CONTACT

SHORT TERM EXPOSURE irritation, blisters

LONG TERM EXPOSURE kidney damage

EYE CONTACT

SHORT TERM EXPOSURE mild irritation

LONG TERM EXPOSURE no information on significant adverse effects

INGESTION

SHORT TERM EXPOSURE irritant, varying dizziness, lethargy/headache symptoms of dizziness, long unconscious

LONG TERM EXPOSURE no information is available

CARCINOGEN STATUS

OSHA: No

NTP: No

IRG: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur: remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs: keep head lower than hips to help prevent aspiration. If person is unconscious: turn head to side. Get medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE EXPOSURE HAZARD: Moderate fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapors or mixtures are explosive above flash point.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam.

Foam: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area, if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area, Cool containers with water from unmanned, hose holder or monitor nozzles until well after fire is out. If fire is responsible then take the following precautions: Keep unnecessary people away; isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tanks and cargo tank truck, Evacuation radius: 400 meters (1/3 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not smother spilled material with high-pressure water stream. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. A vast inhalation of material or combustion by products. Stay upwind and keep out of low areas.

FLASH POINT >120 F (>52 C)
LOWER FLAMMABLE LIMIT >0.5%
UPPER FLAMMABLE LIMIT <4.0%
AUTOIGNITION >475 F (>246 C)
FLAMMABLE CLASS (OSHA) 3

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:

Avoid leak, fumes, sprays and other sources of exposure. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Evacuate for later disposal. Remove sources of ignition. If any unnecessary people are in, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. EPCRA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 106, notify the National Response Center at 1-800-424-8802 (USA) or 1-800-426-0075 (USA).

7. HANDLING AND STORAGE

STORAGE: Store in bottle in accordance with all regulatory criteria and standards. Subject to storage regulations U.S. EPCRA Title III (1980) and Cerritos and bonding required. Keep separated from incompatible substances.

8 EXPOSURE CONTROLS, PERSONAL PROTECTION

15. FUMES & SMOKES

DIESEL FUEL NO. 2

DIESEL FUEL:

100 mg/m³ ACGIH TWA (major and minor oil fumes)

BENZENE

200 mg/m³ ACGIH TWA (restricted, in combination with negligible natural exposure) (skin)

100 mg/m³ NIOSH recommended TWA 10 hour(s)

MEASUREMENT METHOD: Channel tube: Carbon disulfide Gas chromatography with flame ionization detection. MOSH JV #1553 Naphtalen

MINERAL OIL MIST

5 mg/m³ COSH TWA

5 mg/m³ ACGIH TWA

10 mg/m³ ACGIH STEL

5 mg/m³ NIOSH recommended TWA 10 hour(s)

10 mg/m³ NIOSH recommended STEL

MEASUREMENT METHOD: Particulate filter: Carbon tetrachloride Infrared spectrometry. NIOSH JV #0028

HYDROGEN SULFIDE

30 ppm COSH ceiling

50 ppm COSH peak 10 minutes (ceiling if no other reasonable exposure control)

10 ppm (14 mg/m³) OSHA TWA (restricted by 50 ppm ceiling) (see 30, 1000)

15 ppm (21 mg/m³) OSHA STEL (restricted by 50 ppm ceiling) (see 30, 1000)

10 ppm ACGIH TWA

15 ppm ACGIH STEL

10 ppm (15 mg/m³) NIOSH recommended ceiling 10 minutes

14 mg/m³ (10 mEq/m³) DPG MAT (peak limitation criterion - II with correction factor of 2)

5 ppm (7 mg/m³) UK PEL TWA

10 ppm (14 mg/m³) UK PEL STEL

MEASUREMENT METHOD: Channel tube: Aqueous hydrogenethylenes peroxide, ion chromatography. MOSH JV #0003

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be engineered, installed and regularly maintained to ensure proper operation. Ventilation equipment should be engineered, installed and regularly maintained to ensure proper operation. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash station and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing. Remove any chemical soaked clothing immediately.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATION: Use a combination of dependent on a heavy exposure, respiratory protection may be needed. Respiratory protection is needed to reduce exposure to maximum. Consider various properties before use. Any supplied-air respirator with a full facepiece that is opened to a pressure-demand or other positive-pressure mode.

Any self-contained breathing apparatus that has a full facepiece and is opened to a pressure-demand or other

positive-pressure mode.

For Patients: Concentrations or Immediately Dangerous to Life or Health

As supplied, air regulator with full facepiece and opened as a pressure wound or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

COLOR: colorless to brown

ODOR: petroleum odor

BOILING POINT: 240-250 °F (117-300 °C)

FREEZING POINT: 0 °F (15 °C)

VAPOR PRESSURE: 1 mmHg @ 20 °C

VAPOR DENSITY: (air=1) 0.4

SPECIFIC GRAVITY: (water=1) 0.87-0.90

WATER SOLUBILITY: insoluble

PH: Not available

VOLATILE: Not available

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not available

VISCOSITY: 30-40 cP @ 20 °C

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressures.

CONDITIONS TO AVOID: A void heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers. Dangerous gases may accumulate in confined spaces.

INCOMPATIBILITIES: oxidizing materials

DIESEL FUEL

CAUTIONS (STRONG): Fire and explosion hazard

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of sulfur, carbon.

POLYMERIZATION: Will not polymerize

11. TOXICOLOGICAL INFORMATION

DIESEL FUEL RD 3

TOXICITY DATA:

>5 mL/kg skin contact LD50 (mashplace sample) ACUTOX I, 7.5 g/kg oral rat LD50 (mashplace sample)

ACUTOX I

CARCINOGEN STATUS: IARC: Known Inadequate Evidence, Group 3 (Light/dark/diesel-based fuels), ACGIH:

A3: Animal Carcinogen.

LOCAL EFFECTS:

irritant, irritation, etc.

ACUTE TOXICITY LEVEL

Slightly Toxic: Irritant

TOXICITY ORGANS Central nervous system

ADDITIONAL DATA: A recent studies have confirmed an association between the induction of cancer primarily of the lung and inhalation exposure to whole diesel exhaust. Limited epidemiological evidence also suggests an association between occupational exposure to diesel engine emissions and lung cancer (HOGGER, 1999)

HEALTH EFFECTS

INHALATION

ACUTE EXPOSURE

DIESEL FUEL: Vapors or mist may cause respiratory tract irritation. A human exposure has resulted in immediate cough, dyspnea, cyanosis and unconsciousness for one hour. A productive cough with sputum swelling of nasal (not persisted for 30 days). Chest X rays showed diffuse thickening, mostly prominent in the lung bases, which resolved slowly with treatment but was still present at day 30. High levels may also cause central nervous system excitation followed by depression with symptoms possibly including numbness, confusion, ataxia, headache, dizziness, anorexia, nausea, vomiting, weakness, incoordination, stupor, delirium and coma.

CHRONIC EXPOSURE

DIESEL FUEL: Prolonged or repeated exposure may cause irritation. One individual exposed to diesel vapors in a truck cab developed respiratory effects.

SKIN CONTACT

ACUTE EXPOSURE

DIESEL FUEL: May cause stinging, redness and irritation. A sample of diesel fuel applied to rabbits under a patch for 24 hours caused extreme irritation with severe erythema and edema with flaking and open sores.

CHRONIC EXPOSURE

DIESEL FUEL: Repeated or prolonged contact may cause defolting and drying of the skin resulting in irritation and dermatitis. Erythema hyperaemia has been described in exposure to men with occupational exposure to diesel fuel. Two individuals with topical exposure from washing hands or hands with diesel fuel developed acute nasal failure, one also had gastrointestinal symptoms. Repeated applications to rabbits also produced 67% mortality at 10 ml/kg. The primary causes of death were depression and apnoea, which were induced by thermal irritation with infection, rather than systemic intoxication. Autopsy revealed effects on the liver and kidneys.

EYE CONTACT

ACUTE EXPOSURE

DIESEL FUEL: Liquid or vapor may cause slight irritation, although tests with one sample of diesel fuel in rabbit eyes was non-irritating.

CHRONIC EXPOSURE

DIESEL FUEL: Repeated or prolonged exposure may cause irritation.

INGESTION

ACUTE EXPOSURE

DIESEL FUEL: May cause nausea, vomiting, convulsions, ataxia, and possibly symptoms of central nervous system depression. Aspiration of even small amounts during ingestion or vomiting may result in severe pulmonary irritation with coughing, sputum, dyspnea, tachypnea, tachycardia, cyanosis and progressive pulmonary edema and hemorrhage, and death. The probable lethal dose in humans is 0.5-2 g/kg for a 150 pound person. This amount is 1.1 IF cases. Death is due to pneumonia or respiratory failure.

CHRONIC EXPOSURE

DIESEL FUEL: No data available

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 261 (Hazardous Waste Manifests) (DOT) Regulations in accordance with all applicable regulations

14. TRANSPORT INFORMATION

INTERNATIONAL U.S. DOT HCFR 171.03

PROPER SHIPPING NAME (Gross Net)

ID NUMBER UN1002

HAZARD CLASS OR DIVISION 3

PACKING GROUP III

LABELING REQUIREMENTS 2

CANADIAN TRANSPORTATION OF DANGEROUS GOODS

SHIPPING NAME (Gross Net)

ID NUMBER UN1002

CLASS 3

PACKING GROUP III

LAND TRANSPORT ADR

PROPER SHIPPING NAME (Gross Net)

ID NUMBER UN1002

CLASS 3

CLASSIFICATION CODE (F)

PACKING GROUP III

LABEL 2

LAND TRANSPORT RID

PROPER SHIPPING NAME (Gross Net)

ID NUMBER UN1002

CLASS 3

CLASSIFICATION CODE (F)

PACKING GROUP III

LABEL 2

AIR TRANSPORT IATA

PROPER SHIPPING NAME (Gross Net)

ID NUMBER UN1002

CLASS OR DIVISION 3

HAZARD LABELS 3

PACKING GROUP III

AIR TRANSPORT ICAO

PROPER SHIPPING NAME (Gross Net)

ID NUMBER UN1002

CLASS OR DIVISION 3

TABLE 3
ON-PACING GROUP III

MARITIME TRANSPORT INFO:
PROPER SHIPPING NAME: *Chemical*
UN NUMBER: *UN1002*
CLASS OR DIVISION: *2*
PACING GROUP: *III*

15. REGULATORY INFORMATION

US REGULATIONS

CERCLA SECTIONS 101(12) & 102(1) HAZARDOUS SUBSTANCES (40 CFR 302.4)
HYDROGEN SULFIDE: 100 LBS (Q)

SARA TITLE II SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 302.30)
HYDROGEN SULFIDE: 50 LBS (TQ)

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 304.40)
HYDROGEN SULFIDE: 100 LBS (Q)

SARA TITLE III SARA SECTION 302 HAZARDOUS CATEGORICAL CRITERIA (40 CFR 370.31):
ACUTE: *Yes*
CHRONIC: *Yes*
FIRE: *Yes*
REACTIVE: *No*
ENVIRONMENTAL RELEASE: *No*

SARA TITLE III SECTION 303 (40 CFR 373.40)
HYDROGEN SULFIDE: *Administrative (approved Aug. 22, 1994)*

OSHA PROCESS SAFETY (29 CFR 1910.119)
HYDROGEN SULFIDE: 1500 LBS (TQ)

STATE REGULATIONS

California Proposition 65: *Not regulated*

CANADIAN REGULATIONS

WHMIS CLASSIFICATION: *Not determined*

EUROPEAN REGULATIONS

EC CLASSIFICATION (ASSIGNED):

Corrosive Category 2

EC Classification may be inconsistent with independently recorded data.

HAZARD SYMBOL



EC RISK AND SAFETY PHRASES

R 40	Limited evidence of a carcinogenic effect.
S 2	Keep out of the reach of children.
S 260P	Wear suitable protective clothing and gloves

NATIONAL INVENTORY STATUS

D.E. INVENTORY (TSCA) Listed on inventory

TSCA ERM REPORT NOTIFICATION Not listed

15. OTHER INFORMATION

©Copyright 1994-2006 MDL Information Systems, Inc. All rights reserved



1.1 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**WIDE INFORMATION SYSTEMS
INC.**

1281 Macfarlane Road, Suite 200
Buckeye, TE 77017 3323
T 813 360-3000

**EMERGENCY TELEPHONE
NUMBER**

1 800-434-3000 (NORTH AMERICA)
1 703-657-3867 (INTERNATIONAL)

SUBSTANCE: LIQUID-NOX(R)

TECHNICAL INSTRUCTIONS

ENVIRONMENTAL: 11-075 2107-000 2107-007 2107-260 HIGHLY FLAMMABLE, EXTREMELY LIQUID NOX LIQUID
SCHEMATIC: 00000000

PRODUCT USE: *data-supply*

CREATION DATE: Sep 30 1993

REVISION DATE: Mar 15 2000

2. COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT OR HAZARDOUS COMPONENTS IDENTIFIED BY THE MANUFACTURER:

CAS NUMBER: Not entered

EC NUMBER: Not assigned

PERCENTAGE: 100

3. HAZARDS IDENTIFICATION

NEPA RATING SCALE: 4-5: HEALTH=0 FIRE=1 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: yellow

PHYSICAL FORM: liquid

ODOR: faint odor

MAJOR HEALTH HAZARDS: No significant health effects reported

POTENTIAL HEALTH EFFECTS:

IRRITATION:

SHORT TERM EXPOSURE: irritant

LONG TERM EXPOSURE: no information on significant adverse effects

SKIN CONTACT:

SHORT TERM EXPOSURE: irritant

LONG TERM EXPOSURE: no information on significant adverse effects

EYE CONTACT:

SHORT TERM EXPOSURE: no information on significant adverse effects

LONG TERM EXPOSURE: no information on significant adverse effects
INGESTION:
SHORT TERM EXPOSURE: diarrhea
LONG TERM EXPOSURE: no information on significant adverse effects

CARCINOGEN STATUS

OSHA: No

IEC: No

AAC: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur: remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large quantity swallowed: get medical attention.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD: Slightly flammable

EXTINGUISHING MEDIA: carbon dioxide, water, dry chemical, regular foam, water

FIRE FIGHTING: Move container from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of fire area.

FLASH POINT: none, CCC

6. ACCIDENTAL RELEASE MEASURES

OCUPATIONAL RELEASE:

Stop leak if possible without personal risk. Use all spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Use original container for storage recommendations.

8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS

TDOT NOTE:

No occupational exposure limits established

VENTILATION: Provide local exhaust ventilation system. Review compliance with applicable exposure limits

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash/location and quick drench shower in the immediate work area.

CLOTHING: Protective clothing is not required under normal conditions

GLOVES: Wear appropriate chemical resistant gloves

RESPIRATOR: No respirator is required under normal conditions of use. Under conditions of frequent use or heavy exposure, respiratory protection may be needed.

9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

COLOR: yellow

ODOR: faint odor

BOILING POINT: 214°F (101°C)

FREEZING POINT: Not available

VAPOR PRESSURE: Not available

VAPOR DENSITY: Not available

SPECIFIC GRAVITY (water=1): 1.075

WATER SOLUBILITY: soluble

PH: 5

VOLATILITY: Not available

ODOR THRESHOLD: Not available

EVAPORATION RATE: slower than isopyl acetate

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressures

CONDITIONS TO AVOID: A real heat, flames, sparks and other sources of ignition. A real contact with incompatible materials

INCOMPATIBILITIES: oxidizing materials

HAZARDOUS DECOMPOSITION

Thermal decomposition products: oxides of sulfur

POLYMERIZATION: Will not polymerize

11. TOXICOLOGICAL INFORMATION

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE

LIQUID MIXTURE: No data available

CHRONIC EXPOSURE

LIQUID MIXTURE: No data available

SKIN CONTACT:

ACUTE EXPOSURE

LIQUID MIXTURE: May cause irritation, drying and chapping

CHRONIC EXPOSURE

LIQUID MIXTURE: No data available

EYE CONTACT

ACUTE EXPOSURE

LIQUID MIXTURE: No data available

CHRONIC EXPOSURE

LIQUID MIXTURE: No data available

INGESTION

ACUTE EXPOSURE

LIQUID MIXTURE: May cause discomfort and diarrhea.

CHRONIC EXPOSURE

LIQUID MIXTURE: No data available

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT): classified as a hazard

CANADIAN TRANSPORTATION OF DANGEROUS GOODS (No classification assigned)

LARD TRANSPORT ADD: No classification assigned

LARD TRANSPORT RID: No classification assigned

AIR TRANSPORT IATA: No classification assigned

AIR TRANSPORT ICAO: No classification assigned

MARITIME TRANSPORT IMDG: No classification assigned

15. REGULATORY INFORMATION

U.S. REGULATIONS

CFR/49 SECTION 179.101 HAZARDOUS SUBSTANCES (49CFR 179.101): Not regulated

SARA TITLE II SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (49CFR 179.101): Not regulated

SARA TITLE II SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (49CFR 179.101): Not regulated

SARA TITLE III SARA SECTIONS 311-312 HAZARDOUS CATEGORIES (49CFR 179.110):

ACUTE: No

CHRONIC: No

FIRE: No

REACTIVE: No

STUDY RELEASE: No

SARA TITLE III SECTION 311 (49CFR 179.110): Not regulated

OSHA PROCESS SAFETY (29CFR 1910.119): Not regulated

STATE REGULATIONS

California Proposition 65: Not regulated

CANADIAN REGULATIONS

WHMIS CLASSIFICATION: Not determined

EUROPEAN REGULATIONS

EC CLASSIFICATION (CLP CLASIF): Not determined

NATIONAL INVENTORY STATUS

US INVENTORY (TSCA): Listed as inventory

TSCA 2001 REPORT NOTIFICATION: Not listed

16. OTHER INFORMATION

©Copyright 2004-2008 MDL Information Systems, Inc. All rights reserved



1 MATERIAL SAFETY DATA SHEET

1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**MOI INFORMATION SYSTEMS
INC**

1381 Macfarlane Road, Suite 200
Buckalee, TN 37017 3020
1 615 360-3000

**EMERGENCY TELEPHONE
NUMBER**

1 800-424-0000 (NORTH AMERICA)
1 703-527-3867 (INTERNATIONAL)

SUBSTANCE: METHANOL REAGENT ACS

TRADE NAMES/SYNONYMS

METHANOL, TRICHO ALCOHOL, METHYL HYDROXIDE, CARBINOL, MONOHYDROXYMETHANE,
WOOD SPIRIT, WOOD NAPHTHA, METHYLIC, COLONIAL SPIRIT, COLUMBIAN SPIRIT, PYROXYLIC
SPIRIT, CHAO, POA, LIQUA, UN IZM, STCC #94220, CHSL4203, RECS PC3-00000

CHEMICAL FAMILY: *hydroxylic, aliphatic*

CREATION DATE: March 1995

REVISION DATE: Mar 16 2006

2 COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT: METHYL ALCOHOL

CAS NUMBER: 67-58-1

EC NUMBER (EINECS): 200-400-4

PERCENTAGE: >90

COMPONENT: WATER

CAS NUMBER: 7732-18-5

EC NUMBER (EINECS): 201-700-2

PERCENTAGE: <10



3 HAZARDS IDENTIFICATION

NFPA RATING SCALE: 6-6 HEALTH=6 FUEL=6 REACTIVITY=6

EMERGENCY OVERVIEW

COLOR: colorless

PHYSICAL FORM: liquid

ODOR: distinct odor

MAJOR HEALTH HAZARDS: skin irritation, eye irritation, central nervous system depression, nerve damage

PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS

IRRITATION:

FLASH POINT 22°F (3°C) (C)
LOWER FLAMMABLE LIMIT: 8.0%
UPPER FLAMMABLE LIMIT: 36.0%
AUTOIGNITION 753°F (400°C)
FLAMMA BILITY CLASS (NFPA 704): 2

5. ACCIDENTAL RELEASE MEASURES

AIR RELEASE

Reduce vapors with water spray. Reduce vapors with water spray.

SOIL RELEASE

Dry locking area such as lagoons, pond or pit for containment. Take for later disposal. Dry locking area such as lagoons, pond or pit for containment. Take for later disposal.

WATER RELEASE

Cover with absorbent absorbent spill-control pads or pillows. Remove trapped material with suction hoses. Cover with absorbent absorbent spill-control pads or pillows. Remove trapped material with suction hoses.

Allow spilled material to settle.

OCCUPATIONAL RELEASE

Avoid heat, flames, sparks and other sources of ignition. Do not touch spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Take for later disposal. Remove sources of ignition. Keep unnecessary people away. Isolate hazard area and deny entry. Notify Local Emergency Planning Commission and State Emergency Response Commission for release greater than or equal to RCQ (US EPA, Section 304) if release occurs in the U.S. and is reportable under CERCLA, Section 102; notify the National Response Center at (800) 424-9303 (USA) or (302) 424-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to change regulations U.S. OSHA 29 CFR 1910.106. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS: PERSONAL PROTECTION

EXPOSURE LIMITS

METHANOL BLEND 40% ACN

METHYL ALCOHOL (METHANOL)

250 ppm (250 mg/m³) OSHA TWA

250 ppm (250 mg/m³) OSHA STEL (based by 30 PP 3520) (see 30 1343)

250 ppm ACGIH TWA (skin)

250 ppm ACGIH STEL (skin)

250 ppm (250 mg/m³) NIOSH recommended TWA, 30 breaths (skin)

250 ppm (250 mg/m³) NIOSH recommended STEL (skin)

270 mg/m³ (250 mg/m³) STEL NIOSH (peak limitation category 2B with maximum duration of 15 minutes at any time)

250 mg/m³ (250 mg/m³) STEL (skin) (skin) (skin) (skin) (skin) (skin) (skin) (skin) (skin) (skin)

250 ppm (250 mg/m³) OSHA TWA (skin)

250 ppm (250 mg/m³) OSHA STEL (skin)

MEASUREMENT METHRO-B-50 1/4 in. pd tube Water Gas chromatography with flame ionization detector, MICHRO #2000 Method

METHYL ALCOHOL

METHYL ALCOHOL (METHANOL)

200 ppm (200 mg/m³) CSHA TWA

250 ppm (250 mg/m³) CSHA STEL (exceed by 50 PPM 2000 June 30 2001)

200 ppm & CCSH TWA (skin)

250 ppm & CCSH STEL (skin)

200 ppm (200 mg/m³) MDSH recommended TWA 10 hours (1) skin

250 ppm (250 mg/m³) MDSH recommended STEL (skin)

250 mg/m³ (200 ml/m³) DPG MAE (1 peak limitation category -D with maximum factor of 4) (continuous absorption-larger)

500 mg/m³ (200 ml/m³) DPG STEL (maximum absorption-larger) (DMS,V)

200 ppm (200 mg/m³) CSE TWEL TWA (skin)

250 ppm (250 mg/m³) CSE TWEL STEL (skin)

MEASUREMENT METHRO-B-50 1/4 in. pd tube Water Gas chromatography with flame ionization detector, MICHRO #2000 Method

VENTILATION Provide local exhaust or process enclosure ventilation system. Ventilation system should be engineered to replace concentration of material as present. Do not compliance with applicable exposure limits

EYE PROTECTION Wear splash resistant safety goggles. Provide an emergency eye wash location and quick drench shower in the immediate work area.

CLOTHING Wear appropriate chemical resistant clothing

GLOVES Wear appropriate chemical resistant gloves

RESPIRATOR The following respirator and maximum air concentrations are derived from MDSH and/or CSHA

2000 ppm

Air supplied air respirator

5000 ppm

Air supplied air respirator operated in a continuous flow mode

10000 ppm

Air supplied air respirator with a tight-fitting facepiece that is operated in a continuous flow mode

Air self-contained breathing apparatus with a full facepiece

Air supplied air respirator with a full facepiece

Escape :

Air appropriate escape-type, self-contained breathing apparatus

For Release: C as continuous or immediately down to 1.5% or Health

Air supplied air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply

Air self-contained breathing apparatus with a full facepiece

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE Liquid

APPEARANCE clear

COLOR -colorless
ORR -distinct color
MOLECULAR WEIGHT 32.04
MOLECULAR FORMULA C_2H_6O
BOILING POINT 148.7 °C
FREEZING POINT 129.7 F (34 C)
VAPOR PRESSURE 37.2 mmHg @ 20 C
VAPOR DENSITY Gas=2 @ 1 C
SPECIFIC GRAVITY (water=1) 0.7894
WATER SOLUBILITY -soluble
PH -Not available
VOLATILITY -Not available
ODOR THRESHOLD 100 ppm
EVAPORATION RATE 4.1 (ethyl acetate=1)
VISCOSITY 0.20 cP @ 20 C
COEFFICIENT OF WATER/OIL DISTRIBUTION -Not available
SOLVENT SOLUBILITY -
Soluble alcohol, acetone, chloroform, ethanal, ether, hexane

10. STABILITY AND REACTIVITY

REACTIVITY Stable at normal temperatures and pressures

CONDITIONS TO AVOID A -red heat, flames, sparks and other sources of ignition. Minimize contact with material. A -red inhibition of material or combination by-products. B -ray out of water supply and sewage

INCOMPATIBILITIES Incompatible materials include oxidizing materials halogens, metal catalysts, bases, acids.

METHYL ALCOHOL

ACETYL BROMIDE Violent reaction with formation of hydrogen bromide

ALUMINUM SOLUTIONS Violent reaction.

ALUMINUM Corrosive

BARIUM PERCHLORATE Distillation yields highly explosive diethyl perchlorate

BERYLLIUM HYDROXIDE Violent reaction, even at 15° C

BROMINE Vigorously exothermic reaction.

CALCIUM CARBIDE Violent reaction.

CHLORINE Possible reaction and explosion hazard

CHLOROFORM AND SODIUM HYDROXIDE Explosive reaction.

CHROMIUM TRIOXIDE (CHROMIC ANHYDRIDE) Possible reaction.

CYANURIC CHLORIDE Violent reaction.

CYCLOHEXIMETHANE Possible reaction and explosion.

DIBUTYLZINC Possible reaction and explosion.

HYDROGEN PEROXIDE + WATER Explosions hazard

IODINE + ETHANOL + MERCURIC OXIDE Explosions hazard

LEAD Corrosive

LEAD PERCHLORATE Explosions hazard

MAGNESIUM Violent reaction.

MAGNESIUM (POWDERED) Particles are capable of detonation.

METALS Incompatible

NICKEL Possible reaction in the presence of nickel catalyst.

Relatively Non-toxic: inhibition

HEPATIC CONDITIONS AGGRAVATED BY EXPOSURE eye-laceration, kidney-laceration, skin-laceration and ataxias

MUTAGENIC DATA

DNA repair: Escherichia coli: 33 mg/kg cell, mutation in *umu*-mutagenesis: *Salmonella typhimurium* 12 ppb: no chromosomal loss and non-degradation: Aspergillus nidulans: 50000 ppm, cytop-genetic analysis: penicillium: 1000000 3000 ppm: DNA inhibition: human lymphocytes: 300 nmol/L: DNA damage: not used 10 nmol/kg mutation in *umu*-mutagenesis: mouse lymphocytes: 7000 mg/L (45%) cytop-genetic analysis: mouse cell 1 mg/kg cytop-genetic analysis

mouse: intraperitoneal 70 mg/kg morphological transformation: mouse fibroblast 0.01 mg/L (30) 20 mg/kg

REPRODUCTIVE EFFECTS DATA

20000 mg/kg oral rat-TDLo 1-15 days/p postpartum female-maintenance: 20000 mg/kg oral rat-TDLo 1-15 days/p postpartum female-maintenance: 30 mg/kg oral rat-TDLo 6-15 days/p postpartum female-maintenance: 20000 ppm inhalation-rat-TDLo 7 hours/d 7-15 days/p postpartum female-maintenance: 10000 ppm inhalation-rat-TDLo 7 hours/d 7-15 days/p postpartum female-maintenance: 10000 ppm inhalation-rat-TDLo 7 hours/d 7-15 days/p postpartum female-maintenance: 300 ppm oral rat-TDLo 20 hours/d 70 weeks (male: 3000 mg/kg oral rat-TDLo 10 days/p postpartum female-maintenance: 40 mg/kg oral mouse-TDLo 6-15 days/p postpartum female-maintenance: 4 mg/kg oral mouse-TDLo 7 days/p postpartum female-maintenance: 1000 ppm inhalation-mouse-TDLo 6 hours/d 7-15 days/p postpartum female-maintenance: 3000 ppm inhalation-mouse-TDLo 7 hours/d 6-15 days/p postpartum female-maintenance: 7000 ppm inhalation-mouse-TDLo 7 hours/d 6-15 days/p postpartum female-maintenance: 2000 ppm inhalation-mouse-TDLo 7 hours/d 6-15 days/p postpartum female-maintenance: 10000 ppm inhalation-mouse-TDLo 7-10 days/p postpartum female-maintenance: 5 mg/kg intra-peritoneal-mouse-TDLo 5 days (male: 10000 ppm inhalation-rat-TDLo 7 hours/d 7-15 days/p postpartum female-maintenance: 6000 mg/kg oral rat-TDLo 15-17 days/p postpartum female-maintenance: 6000 mg/kg oral rat-TDLo 17-19 days/p postpartum female-maintenance: 3-6 mg/kg inhalation-rat-TDLo 1-20 days/p postpartum female-maintenance: 45 mg/kg oral rat-TDLo 20 days/p postpartum female-maintenance: 62 mg/kg oral rat-TDLo 20 days/p postpartum female-maintenance

A CONTINGENT DATA: May cause blindness

METHYL ALCOHOL

IRRITATION DATA

20 mg/24 hours/d skin-irritation-test: 40 mg -non-irritation-test, 100 mg/24 hours/d eye-irritation-test

TOXICITY DATA

3070 mg/kg oral-mouse-TDLo: 3430 mg/kg oral-mouse-TDLo: 6420 mg/kg oral-mouse-LDLo: 3420 mg/kg oral-mouse-TDLo: 420 mg/kg oral-human-LDLo: 140 mg/kg oral-human-LDLo: 4 mg/kg oral-woman-LDLo: 50000 mg/kg inhalation-human-TDLo: 300 ppm inhalation-human-TDLo: 300 mg/kg respiratory-mouse-LDLo: 60000 ppm/h hours/p inhalation-rat-LD50: 7000 mg/kg intraperitoneal-rat-LD50: 2120 mg/kg intra-mouse-rat-LD50: 7000 mg/kg oral-mouse-LD50: 30 mg/kg/h hours/d inhalation-mouse-LDLo: 10700 mg/kg intraperitoneal-mouse-LD50: 4720 mg/kg intravenous-mouse-LD50: 7000 mg/kg oral-day-LDLo: 7 mg/kg oral-mouse-LD50: 1000 ppm inhalation-mouse-LDLo: 300 mg/kg skin-mouse-LDLo: 44 mg/kg/h hours/d inhalation-rat-LDLo: 4040 mg/kg intravenous-rat-LDLo: 14200 mg/kg oral-rat-LD50: 15000 mg/kg skin-rat-LD50: 1650 mg/kg intra-peritoneal-rat-LDLo: 1000 mg/kg intravenous-mouse-LD50: 3000 mg/kg respiratory-mouse-LD50: 3000 mg/kg respiratory-human-LD50: 20 mg/kg percutaneous-frog-LDLo: 1 mg/kg oral rat-TDLo: 3000 ppm/h hours/d inhalation-rat-TDLo: 9000 mg/kg intravenous-mouse-LD50: 420 mg/kg oral-mouse-LDLo: 130000 mg/kg/h hours/d inhalation-mouse-TDLo: 40000 mg/kg/h hours/d inhalation-mouse-TDLo: 5000 mg/kg oral-rat-LD50: 3400 mg/kg intraperitoneal rat-TDLo: 7000 mg/kg oral-rat-LDLo: 10000 mg/kg/h hours/d inhalation-rat-LD50: 4400 mg/kg/h hours/d inhalation-rat-LDLo: 5000 mg/kg oral-mouse-LDLo: 1000 mg/kg inhalation-mouse-LDLo: 3000 mg/kg oral rat-TDLo: 10 mg/kg oral-woman-LDLo: 3 mg/kg oral-rat-TDLo: 3000 mg/kg/h hours/d intraperitoneal rat-TDLo: 17 mg/kg/h weeks/d intraperitoneal rat-TDLo: 7 mg/kg/h days/p intraperitoneal rat-TDLo: 50 mg/kg/h hours/d 15 weeks/d intraperitoneal inhalation-rat-TDLo: 3000 ppm/h hours/d 4 weeks/d intraperitoneal inhalation-rat-TDLo: 3000 mg/kg/h days/p intraperitoneal intraperitoneal rat-TDLo: 200 mg/kg/h days/d intraperitoneal rat-TDLo: 2 mg/kg/h days/p intraperitoneal-rat-mouse-TDLo: 6-5 mg/kg/h hours/d 4 weeks/d intra-peritoneal inhalation-mouse-TDLo: 6-5 mg/kg/h hours/d 4 weeks/d intra-peritoneal inhalation-rat-TDLo: 30 mg/kg/h hours/d 120 days/p intraperitoneal inhalation-rat-TDLo: 620 mg/kg/h days/p intra-mouse oral rat-TDLo

CHRONIC EXPOSURE

METHYL ALCOHOL. Reported or prolonged contact with the liquid may cause debility of the skin resulting in erythema, scaling, and occasional dermatitis. Chronic absorption may result in metabolic acidosis and effects as detailed in acute exposure.

EYE CONTACT

ACUTE EXPOSURE

METHYL ALCOHOL. Vapors may cause irritation. High concentrations have been reported to cause violent inflammation of the conjunctiva and epithelial defects on the cornea. Mild irritation may occur with dilute solutions. The undiluted liquid has produced moderate corneal opacity and conjunctival edema in rabbits. Application of a layer of methanol on rabbit eyes caused a mild reversible reaction, graded 2 on a scale of 1-10 after 24 hours.

CHRONIC EXPOSURE

METHYL ALCOHOL. Reported or prolonged contact may cause conjunctivitis.

INGESTION

ACUTE EXPOSURE

METHYL ALCOHOL. May cause mild and transient irritation and subsequent discomfort followed by an asymptomatic period lasting 8-48 hours. Followed by the delay or cramping dyspepsia, headache, dizziness, weakness, vertigo or transient nausea, vomiting, generalized flushing, anorexia, violent pain in the back, abdomen, and sometimes inflammation of the oropharynx and larynx, and rarely asystole and cardiac arrest may occur. Rapid shallow respiration due to metabolic acidosis, cold and clammy skin, hypotension, cyanosis, epistaxis, convulsions, mild tachypnea, cardiac depression, peripheral vascular cerebral and pulmonary edema, unconsciousness, and coma are possible. Effects on the eye may include optic neuritis, blurred or double vision, dilated, nonresponsive pupils, ptosis, nose pain, conjunctival congestion, loss of visual fields, diplopia, change in color perception, photophobia, and optic nerve atrophy. Partial blindness or possibly delayed transient or permanent blindness may occur. Bilateral sensorimotor deafness has been reported in a single case. Liver, kidney, heart, stomach, intestinal, and pancreatic damage may also occur. Death may be due to respiratory failure or rarely from circulatory collapse. As little as 25 ml has caused blindness. The usual fatal dose is 70-240 ml. Pulmonary edema and irreversible effects on the nervous system including difficulty in speech, motor dysfunction with rigidity, spasticity, and hypokinesia have been reported.

CHRONIC EXPOSURE

METHYL ALCOHOL. Reported ingestion may cause varied impairment and blindness and other systemic effects as detailed in acute exposure. Reproductive effects have been reported in animals.

13. ECOLOGICAL INFORMATION

ECOTOXICITY DATA

FISH TOXICITY: 74.9 ug/L, 36 hours (LC50) (Mortality) (Oligone) (Oligone gobies)

INVERTEBRATE TOXICITY: 383 ug/L, 48 hours (LC50) (Invertebrates) (Water flea) (Daphnia magna)

ALGAL TOXICITY: 300-400 ug/L, 8 hours (LC50) (Populations) (Algae, phytoplankton, algal mat) (Algae)

PHYTOXICITY: 0.1 ug/L, 24 weeks (LC50) (Invertebrates) (Algae) (Zostera marina)

OTHER TOXICITY: 3.2 ug/L, 3-20 days (LC50) (Algae) (Aquatic community) (Aquatic community)

FATE AND TRANSPORT

BIOCONCENTRATION: 1,000 ug/L, 48 hours (BCF) (Residue) (Algae) (Leporeum macrochlamys) 2.7 ug/g.

ENVIRONMENTAL SUMMARY: Highly toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 302 Hazardous Waste Number(s) UN198, Dispose in accordance with all applicable regulations

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 173.11:
PROPER SHIPPING NAME: *Refused*
ID NUMBER: UN1980
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3 & 1

CANADIAN TRANSPORTATION OF DANGEROUS GOODS: *No classification assigned*

LAND TRANSPORT ADR:
PROPER SHIPPING NAME: *Refused*
DE NUMBER: UN1980
CLASS: 3
CLASSIFICATION CODE: F+1
PACKING GROUP: II
LABELS: 3 & 1

LAND TRANSPORT RID:
PROPER SHIPPING NAME: *Refused*
DE NUMBER: UN1980
CLASS: 3
CLASSIFICATION CODE: F+1
PACKING GROUP: II
LABELS: 3 & 1

AIR TRANSPORT IATA:
PROPER SHIPPING NAME: *Refused*
DE/D NUMBER: UN1980
CLASS OR DIVISION: 3
SECTIONAL NET MASS: 0.1
HAZARD LABELS: 3 & 1
PACKING GROUP: II

AIR TRANSPORT ICAO:
PROPER SHIPPING NAME: *Refused*
DE NUMBER: UN1980
CLASS OR DIVISION: 3
SECTIONAL NET MASS: 0.1
LABELS: 3 & 1
DE PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: *Refused*
DE NUMBER: UN1980
CLASS OR DIVISION: 3

**PACING GROUP 2
SUBSISTANT RELEASE 2.1**

16. REGULATORY INFORMATION

16.1 FEDERAL REGULATIONS

**CERCLA SECTION 102(a)(1) HAZARDOUS SUBSTANCES (HCS) (262.6)
METHYL ALCOHOL (METHANOL) (260.125.2)**

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 302.60-126)
*regulated***

**SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 304.60-126)
*regulated***

SARA TITLE III SARA SECTIONS HIGHER HAZARDOUS CATEGORIES (40 CFR 309.10)

ACUTE: Yes

CHRONIC: Yes

PNE: Yes

REACTIVE: No

SEMI-RELEASE: No

SARA TITLE III SECTION 303 (40 CFR 303.6)

METHYL ALCOHOL (METHANOL)

OSHA PROCESS SAFETY (HCS) (1910.119) *(Not regulated)*

16.2 STATE REGULATIONS

California Proposition 65 *(Not regulated)*

16.3 CANADIAN REGULATIONS

WHMIS CLASSIFICATION *(Not determined)*

16.4 EUROPEAN REGULATIONS

EC CLASSIFICATION ASSIGNED

F	Highly Flammable
T	Toxic

EC Classification may be inconsistent with independently researched data.

16.5 DANGEROUS HAZARD SYMBOL



16.6 EC HSE AND SAFETY PHRASES

R 11	Highly Flammable
R 20/21	Toxic by inhalation, in contact with skin and if swallowed
R 22/23/24	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed
S 1/2	Keep locked up and out of the reach of children.

S-7	Keep container tightly closed.
S-10	Keep away from sources of ignition. No smoking.
S-20/22	Flammable/Highly flammable clothing and gloves
S-43	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)

CONCENTRATION UNITS

C=CON% T.R. 25/04/25-26/0004/25

IPR=C=CON% T.R. 20/01/25 25/03/04/25

2%~C~10% 30x R 20/01/25-25/00/23/25

SEEMAN REGISTRATION

WATER HAZARD CLASS (M/G)

STATE OF CLASSIFICATION: No Vels

CLASSIFICATION UNDER HAZARD TO WATER: I

NATIONAL INVENTORY STATUS

U.S. INVENTORY (TSCA): Listed as secondary

TSCA EXM EXPORT NOTIFICATION: Not listed

16. OTHER INFORMATION

MSDS SUMMARY OF CHANGES

I EXPOSURE CONTROLS PERSONAL PROTECTION

©Copyright 1994-2006 MDL Information Systems, Inc. All rights reserved



15 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MOB INFORMATION SYSTEMS INC

1381 Macintosh Road, Suite 200
Buckle, TN 37017-3123
1-615-388-3000

EMERGENCY TELEPHONE NUMBER

1-800-424-6006 (NORTH AMERICA)
1-703-877-3867 (INTERNATIONAL)

SUBSTANCE: GASOLINE, AUTOMOTIVE, UNLEADED

TRADE NAME(S) & SYNTHES

UNLEADED GASOLINE, PREMIUM UNLEADED GASOLINE, PETROL, MOTOR SPIRITS, BENZOL
GASOLINE, "A" GRADE GASOLINE, "B" GRADE GASOLINE, UNLEAD GASOLINE, BENCH, LIGHTER OIL

CHEMICAL FAMILY: petroleum hydrocarbon

CREATION DATE: Apr 23 1995

REVISION DATE: Mar 18 2006

2. COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT: GASOLINE, AUTOMOTIVE, UNLEADED

CAS NUMBER: 8006-61-2

EC NUMBER (EINECS): 222-049-1

PERCENTAGE: 100

COMPONENT: BLENDED

CAS NUMBER: 71-43-2

EC NUMBER (EINECS): 200-753-7

PERCENTAGE: ~1



3. HAZARDS IDENTIFICATION

SEPA HAZARD SCALE: 9+H+ HEALTH=2 FOD=2 REACTIVITY=0

EMERGENCY OVERVIEW

COLOUR: colorless to amber

PHYSICAL FORM: volatile liquid

ODOR: distinct odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, cancer hazard (in humans)

PHYSICAL HAZARDS: Extremely flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS

IRITATION:

SHORT TERM EXPOSURE irritation, ringing in the ears, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, dizziness, dizziness, difficulty speaking, blood pressure, loss of consciousness, blurred vision, dilated pupils or pin-point pupils, loss of consciousness, kidney damage, liver damage, effects on the fetus, cardiovascular, reproductive, cancer.

LONG TERM EXPOSURE changes in body temperature, changes in blood pressure, nausea, loss of appetite, difficulty breathing, irregular heartbeat, headache, dizziness, dizziness, dizziness, sleep disturbances, blood orange, loss of consciousness, hearing loss, visual disturbances, menstrual disorders, blood disorders, kidney damage, liver damage, reproductive effects, brain damage, cancer.

SKIN CONTACT

SHORT TERM EXPOSURE irritation, blisters, changes in blood pressure, stomach pain, blood disorders, heart, damage, kidney damage, liver damage, effects on the fetus.

LONG TERM EXPOSURE irritation, blisters, skin disorders, tingling sensations.

EYE CONTACT

SHORT TERM EXPOSURE irritation, visual disturbances.

LONG TERM EXPOSURE irritation, eye damage.

INGESTION

SHORT TERM EXPOSURE changes in body temperature, nausea, vomiting, diarrhea, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, dizziness, dizziness, blood orange, nausea, loss of consciousness, blurred vision, blood clot color, lung congestion, lung damage, internal bleeding, pneumonia, cardiovascular, reproductive, cancer, organ has failed.

LONG TERM EXPOSURE reproductive effects, cancer.

CARCINOGEN STATE

OSHA: Yes

BP: Yes

AAC: Yes

4. FIRST AID MEASURES

DECONTAMINATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. **DO NOT** induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

NOTE TO FIRE FIGHTER: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD: Severe fire hazard. The vapors are heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vaporizer reactions are explosive.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam.

Lump form: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool container with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area, Cool container with water from underneath hose holder or monitor nozzle until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any change in sound of tank due to fire. For tank, rail car or tank truck, Evacuation radius: 100 meters (1/2 mile). Water may be ineffective.

FLASH POINT: -49 F (-43 C) (CC)
LOWER FLAMMABLE LIMIT: 1.2%
UPPER FLAMMABLE LIMIT: 7.4%
AUTOIGNITION: 100-103 F (38-40 C)
FLAMMA BLETT CLASS: (GHS) 2

6 ACCIDENTAL RELEASE MEASURES

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1984 (Proposition 65). Keep out of water supply and sewers.

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Stay back if possible without personal risk. Reduce vapors with water spray. Neutral spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Order for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than reported to RCFUS. **SAFHA Section 2041** If release occurs in the U.S. and is reportable under CERCLA Section 102, notify the National Response Center at 1-800-424-9302 (USA) or 1-312-626-2070 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all relevant regulations and standards. Subject to all applicable regulations. **U.S. OSHA 29 CFR 1910.105** Grounding and bonding required. See regional or national fire agency recommendations. Keep away from incompatible materials.

8. EXPOSURE CONTROLS: PERSONAL PROTECTION

EXPOSURE LIMITS:

GASOLINE, AUTOMOTIVE UNLEADED

GASOLINE (HEAVY HANDLING)

100 ppm (100 mg/m³) OSHA TWA (based by 35 FR 18200 (Jan 28 1970))
100 ppm (1500 mg/m³) OSHA STEL restricted by 35 FR 18210 (Jan 28 1970)
100 ppm ACGIH TWA
100 ppm ACGIH STEL
NIOSH considers no safe TWA (lowest feasible concentration)

BENZENE

1 ppm OSHA TWA
5 ppm OSHA STEL (8 reported)
0.5 ppm OSHA action level

10 ppm COSHA TWA (applies to and excepts except from benzene standard 1510 102F)
25 ppm COSHA ceiling (applies to and excepts except from benzene standard 1510 102F)
50 ppm COSHA peak 10 minutes (applies to and excepts except from benzene standard 1510 102F)
0.5 ppm ACCH TWA (skin)
2.5 ppm ACCH STEL (skin)
0.1 ppm HOOH recommended TWA 10 hours
1 ppm HOOH recommended STEL
50% MAC (benzene chlorophyll changed)
2.25 mg/dl (1 ul/dl) ACH TWA (effects on 1 Jan 2005 no longer valid per amendment)
2.25 mg/dl (1 ul/dl) SC COH TWA (skin) (SCCLV)
1 ppm GE PEL TWA (skin)

MEASUREMENT METHOD: Chemical tests: Carbon dioxide; Gas chromatography with flame ionization detection, SENSITIV #1500 Hydrocarbon ALD #2700 #1500

VENTILATION: Ventilation systems should be designed to maintain concentrations of vapors at or below the recommended level. Provide local exhaust or process enclosure ventilation system. Exhaust connections with appropriate exhaust limits

EYE PROTECTION: Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash location and eyewash device shown on the immediate work area

CLOTHING: Remove any chemical soaked clothing immediately. Wear appropriate chemical resistant clothing

GLOVES: Wear appropriate chemical resistant gloves

RESPIRATOR: Under most circumstances, use of heavy exposure respiratory protection may be needed. Respiratory protection is needed in order to protect workers in maximum. Consider wearing protection before use. Any chemical cartridge respirator with organic vapor cartridge(s)

Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)

Any air purifying respirator with a full facepiece and no organic vapor cartridge

For full use C concentrations as listed under Respiratory Protection in Life or Health

Any supplied air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply

Any self-contained breathing apparatus with a full facepiece

9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOUR: colorless to amber

PHYSICAL FORM: volatile liquid

ODOR: faintest odor

BOILING POINT: 100-105 F(38-40 C)

FREEZING POINT: Not available

VAPOR PRESSURE: Not available

VAPOR DENSITY (air=1): 3.0-4.0

SPECIFIC GRAVITY (water=1): 0.7-0.8

WATER SOLUBILITY: insoluble

PH: Not available

VOLATILITY: Not available

ODOR THRESHOLD: 0.25 ppm

EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION / Not available
SOLVENT SOLUBILITY
Soluble: alcohol, alcohol, ether, chloroform, benzene

10. STABILITY AND REACTIVITY

REACTIVITY Stable at normal temperatures and pressures.

CONDITIONS TO AVOID A real heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supply and drains.

INCOMPATIBILITIES oxidizing materials

**CARLINE AUTOMOTIVE UNLEADED
CAUTIONS (STRONG)** Fire and explosion hazard

HAZARDOUS DECOMPOSITION
Thermal decomposition products: oxides of carbon.

POLYMERIZATION Will not polymerize

11. TOXICOLOGICAL INFORMATION

**CARLINE AUTOMOTIVE UNLEADED
IRRITATION DATA**

500 mg/24 hours (i) skin-irritant (ii)

TOXICITY DATA

LD50 orally and subcutaneous 10000 mg/kg and subcutaneous 10000 mg/kg skin-irritant LD 50 mg/kg (2 weeks) intraperitoneal, oral and subcutaneous 10 mg/kg (2 weeks) intraperitoneal and subcutaneous 4 mg/kg (24 hours) (24 hours) intraperitoneal subcutaneous and subcutaneous 1000 mg/kg (24 hours) intraperitoneal subcutaneous and subcutaneous

CARCINOGEN STATUS IARC: Human Inadequate Evidence, Animal Limited Evidence, Group 3B. ACGIH: A3. Animal Carcinogen.

In studies with mice and rats by inhalation, an increased incidence of hepatocellular adenomas and carcinomas was produced in female but not male mice; an increased incidence of adenomas and carcinomas of the kidney was produced in male but not female rats.

LOCAL EFFECTS

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL

Slightly Toxic: ingestion

TARGET ORGANS central nervous system.

TUMORIGENIC DATA

1000 ppm inhalation-subcutaneous 70 weeks of continuous; 1000 ppm inhalation-subcutaneous 70 weeks (i) intraperitoneal, 1000 ppm inhalation-subcutaneous 70 weeks (i) intraperitoneal.

ADDITIONAL DATA A local may enhance the toxic effects. Effects such as epinephrine may induce ventricular fibrillation.

Toxicity and irritation data derived from unspecified and individual products

REMARKS

IRRITATION DATA

15 mg/24 hours (i) open skin-irritant (ii) 10 mg/24 hours (i) skin-irritant (ii) 50 mg/eye irritant (moderate) 2 mg/24 hours (i) eye-irritant (moderate)

[illegible]

CARCINOGEN STATES: OSHA: Carcinogen, NTP: Known Human Carcinogen, IARC: Human Probable Carcinogen, Animal Sufficient Evidence, Group I. AODH: A1 - Confirmed Human Carcinogen, EC: Category I. TRIS: NTP: X.

Human case reports and series have suggested a site-specific helminth response to benzene and the occurrence of various types of leukaemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, historical exposure patterns and poorly defined exposures versus their corresponding controls. Three independent cohort studies have demonstrated an increased incidence of acute myelopharyocytic leukaemia in workers exposed to benzene.

1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 2757 2758 2759 2760 2761 2762 2763 2764 2765 2766 2767 2768 2769 2770 2771 2772 2773 2774 2775 2776 2777 2778 2779 2780 2781 2782 2783 2784 2785 2786 2787 2788 2789 2790 2791 2792 2793 2794 2795 2796 2797 2798 2799 2800 2801 2802 2803 2804 2805 2806 2807 2808 2809 2810

[illegible]

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Published Online: 12 November 2008

[illegible]

TARGET AUDIENCE anyone who requires flexible, scalable resources

MEDICAL CONDITIONS ASSOCIATED BY EXPOSURE blood system disorders immune system disorders, etc.

TUMORIGENIC DATA

200 mg/kg inhibition-rates TCLo₅₀ week(s) intermittent, 10 ppm inhibition-l-rates TCLo₅₀ hours(-)-10 pmol(s) intermittent, 10 mg/kg oral rat TCLo₅₀ week(s) intermittent, 1000 ppm inhibition-rat TCLo₅₀ hours(-) 10 week(s) continuous, 10000 mg/kg oral-mouse TCLo₅₀ year(s) continuous, 200 ppm inhibition-mouse TCLo₅₀ hours(-) 10 week(s) intermittent, 1000 mg/kg chloromane TCLo₅₀ week(s) intermittent, 1000 mg/kg cytopositive mouse TCLo₅₀ week(s) intermittent, 500 mg/kg methoxanthone-mouse TCLo₅₀ week(s) intermittent, 570 mg/kg pyrenol-mouse TCLo₅₀ week(s) intermittent, 100 ppm inhibition-human TC (12 months (-) 10 year(s) intermittent, 10 mg/kg oral rat TC (1 year(s) intermittent, 10 mg/kg oral rat TC (2 week(s) intermittent, 600 mg/kg inhibition-rat TC (4 pmol(s) intermittent, 100 ppm inhibition-rat TC (10 year(s) intermittent, 1000 ppm inhibition-mouse TC (1 hour(-) 10 week(s) intermittent, 2400 mg/kg oral-mouse TC (8 weeks) intermittent, 0 ppm inhibition-human TC (4 week(s) intermittent, 10 mg/kg inhibition-human TC (1 year(s) intermittent, 200 ppm inhibition-mouse TC (1 hour(-) 10 week(s) intermittent, 51500 mg/kg oral rat TCLo₅₀ week(s) intermittent, 100000 mg/kg oral rat TCLo₅₀ week(s) intermittent, 12070 mg/kg oral-rat TCLo₅₀ week(s) intermittent, 12070 mg/kg oral-mouse TCLo₅₀ week(s) intermittent, 51500 mg/kg oral-mouse TCLo₅₀ week(s) intermittent.

MUTAGENIC DATA

Metazoa in vivo assays - *Salmonella typhimurium* 10 ppm (-) 801 - specific locus test - *Drosophila melanogaster* and 11200 mg/kg, non chromosome loss and non-disjunction - *Drosophila melanogaster* multiple 27000 ppm, mutation in transposable *Sanctimonium cerevisiae* 540 mg/L (-) 801 - gene conversion and recombination - *Sanctimonium cerevisiae* 270 mg/L, non chromosome loss and non-disjunction - *Aspergillus nidulans* 20000 ppm, other mutation test systems - pyrenol-mutation 14 ppb 16 hours (-) other mutation test systems - non-mutagenic species (10 per tested 70 mg/kg DNA inhibition - human lymphocyte 2000 mg/kg, DNA inhibition - human Hela cell 2000 mg/kg, other mutation test systems - human lymphocyte 5 mg/mL, cytogenetic analysis - human inhibition 120 ppm 1 year(s) - cytopositive analysis - human lymphocyte 1 mg/mL, TC (hour(s) - cytopositive analysis - human lymphocyte 1 mg/L, cytopositive analysis - human lymphocyte 10 ppm 4 week(s) water chemical mutagen - human lymphocyte 300 mg/mL, mutation in mammalian somatic cells - human lymphocyte 1 mg/L, mutagenesis test - rat inhibition 1 ppm 6 hours (-) unscheduled DNA synthesis rat liver 1 mg/mL, DNA inhibition rat inhibition 400 ppm, other mutation test systems - rat liver 1 mg/mL, other mutation test systems - rat bone marrow 1 mg/mL, other mutation test systems - rat inhibition 1 ppm, other mutation test systems - rat inhibition 2000 mg/kg cytogenetic analysis - rat inhibition 200 mg/kg 10 week inhibition test, cytogenetic analysis - rat inhibition 2000 mg/kg 12 days (-) intermittent, cytogenetic analysis - rat cytopositive 204 mg/kg cytogenetic analysis - rat 20000 mg/kg water chemical mutagen - rat inhibition 5 ppm 6 hour(s) water chemical mutagen - rat lymphocyte 1 mg/mL, mutagenesis test mouse embryo 17000 mg/mL, mutagenesis test mouse inhibition 640 mg/kg mutagenesis test mouse and 10 mg/kg mutagenesis test mouse cytopositive 204 mg/kg 24 hour(s) mutagenesis test mouse inhibition 10 ppm 6 hours (-) mutation in transposable mouse lymphocyte 62000 mg/L (-) 801 - mutation in transposable mouse embryo 2000 mg/L (-) 801 morphological transformation mouse embryo 1 pmol, morphological transformation mouse fibroblast 100 pmol, DNA damage - mouse lymphocyte 2040 mg/mL, DNA adduct mouse cytopositive 2040 mg/kg 3 day (-) continuous other mutation test systems mouse and 2 mg/kg other mutation test systems - mouse other cell types 5 mg/mL, DNA inhibition mouse and 20 mg/kg other mutation test systems - mouse lymphocyte 10 mg/mL, DNA inhibition - mouse cytopositive 500 mg/kg, DNA inhibition mouse inhibition 2000 ppm 4 hour (-) continuous DNA inhibition mouse bone marrow 3 mg/mL, water chemical mutagen mouse inhibition 10 ppm 6 hours (-) water chemical mutagen mouse cytopositive 5 mg/kg cytogenetic analysis mouse and 20 mg/kg cytogenetic analysis mouse cytopositive 204 mg/kg 3 day (-) continuous cytogenetic analysis mouse inhibition 2000 ppm 6 hour (-) continuous test mouse and 1 mg/kg chromosomal test mouse cytopositive 204 mg/kg mutation in mammalian somatic cells mouse lymphocyte 12000 mg/L, mutation in mammalian somatic cells mouse inhibition 40 ppb 6 week(s) continuous mutation in mammalian somatic cells mouse and 2 mg/kg 3 day (-) continuous morphological transformation human fibroblast 100 mg/L, DNA damage hamster ovary 17 mg/mL, cytopositive analysis hamster lung 100 mg/L, cytogenetic analysis - hamster ovary 100 mg/L, water chemical mutagen hamster ovary 700 mg/L, non chromosome loss and non-disjunction - hamster liver 62000 mg/L, non chromosome loss and non-disjunction - hamster embryo 20 mg/mL, mutation in mammalian somatic cells - hamster embryo 10 mg/mL, DNA damage - methylmethanesulfoxide 204 mg/kg, DNA inhibition methylmethanesulfoxide 2 mg/kg other mutation test systems methyl bone marrow 1 mg/mL, other mutation test systems rat bone marrow 1 mg/mL, cytogenetic analysis methylmethanesulfoxide 10400 mg/kg DNA damage mouse cytopositive 2000 mg/kg DNA damage

impairments. Chromosomal damage has been found after exposure to trace levels. Although hematotoxicity is not a significant concern in acute exposure, delayed hematological effects, including anemia and thrombocytopenia, have been reported. In acute preclinical hemorrhation experiments, internal bleeding and secondary infections. In fatal exposures, death may be due to asphyxia, central nervous system depression, cardiac or respiratory failure and circulatory collapse, or occasionally sudden ventricular fibrillation. It may occur within a few minutes to several hours, or cardiac arrest may occur at anytime within 24 hours. Also, death from central nervous system, respiratory or hematologic complications may occur up to 5 days after exposure. Pathologic findings have included respiratory inflammation with edema and hemorrhage of the lungs, renal congestion, cerebral edema, and extensive preterminal hemorrhage in the brain, pleural pericardium, urinary tract, various muscle areas, and skin.

CHRONIC EXPOSURE

GASOLINE: AUTOMOTIVE UNLEADED: With few exceptions, most of the reported effects of repeated inhalation are from intentional "testing" of gasoline rather than workplace exposure. Reported symptoms include headache, nausea, fatigue, anorexia and weight loss, pallor, decreased anorexia, memory loss, concentration impairment, muscular weakness and atrophy, peripheral neuropathy, polyneuritis and neuritis. It is unclear whether some of these symptoms may have been due to gasoline containing lead. Liver and kidney damage are also possible. In a 30 day study, male beagle ferrets were exhibited a severe dose-related nasal toxicity. In another study, an increase in renal adenomas and carcinoma in male rats and an increase in hepatocellular adenomas and carcinoma in female rats were reported.

FIREFIGHTING: Long-term exposure may cause symptoms referable to the central nervous, hematopoietic and immune systems. Early effects are vague and nonspecific and may include headache, light-headedness, decreased anorexia, anorexia, abdominal discomfort, and fatigue from dyspnea, weakness, lethargy, nausea, decreased consciousness, and irritability have also been reported. Later there may be dyspnea, pallor, slightly increased temperature, decreased blood pressure, rapid pulse, palpitations, and renal disturbances. Decreases when cold water is placed in the ear and hearing impairment have been reported. In acute effects, centrally-acting anesthetic with ataxia, tremors and muscular inhibition. Workers exposed to benzene in combination with other solvents have exhibited polyneuritis. Several case reports, one of them an acute exposure, suggest the possibility that exposure to gasoline may be associated with reticulohistiocytic leukemia. Occasionally hemorrhages in urine and conjunctiva occur and rarely spontaneous edema and papilledema have occurred along with the retinal hemorrhages. Hematological effects vary widely and may appear after a few weeks or many years of exposure or even many years after exposure has ceased. The degree of exposure below which no blood effects will occur cannot be established with certainty. In the early stages, there may be blood clotting defects due to morphological, functional and quantitative platelet alterations with increased bleeding from the nose and gums, easy bruising and petechiae, leukopenia with predominant lymphocytopenia or neutropenia, and anemia which may be normochromic or macrocytic and hypochromic. Extramedullary hematopoiesis, splenomegaly, circulating immature marrow cells and an initial increase in leukocytes, erythrocytes and platelets have also been reported. The bone marrow may be hyper-, hypo- or normoplastic and does not always correlate with the peripheral blood picture. Also, the symptoms do not always parallel the laboratory findings. If treated at this stage, the effects appear reversible, although recovery may be protracted and there may be relapses. Decreased erythrocyte survival, hemolytic anemia, erythrocyte fragility, reduced hemoglobin, iron metabolism disturbances, and hypochloridemia have also been reported. Exposure to high levels for longer periods may result in aplasia and pancytopenia of the bone marrow with pancytopenia. The most serious cases of aplastic anemia may be fatal due to hemorrhage and infection; death may occur within 3 months of diagnosis. However, several long-term studies suggest, including one done by epidemiologists, and the finding of normoplastic marrow that, in some cases, the blood dyscrasia may partially be an allergic reaction. Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene. Retrospective exposure patterns and poorly defined exposures render these interpretations difficult. Three independent cohort studies have demonstrated an increased incidence of acute myeloid leukemic leukemia in workers exposed to benzene. Several case-control studies have also shown increased odds ratios for exposure to benzene. Retrospective exposure patterns and poorly defined exposures render these interpretations difficult. Three independent cohort studies have demonstrated an increased incidence of acute myeloid leukemic leukemia in workers exposed to benzene. Several case-control studies have also shown increased odds ratios for exposure to benzene and lymphomas, both Hodgkin's and non-Hodgkin's. Although aplastic anemia is probably the most likely consequence of long-term exposure, it is not uncommon for an individual receiving this "toxic shock" to progress to phase into acute leukemia. Commonly leukemia with a precursor aplastic phase can occur. In one

study the cause-of-time from the start of the exposure to the diagnosis of leukemia was 3-24 years. It has been suggested that the chromosomal alterations which can arise in peripheral blood and bone marrow cells and persist for a long time after exposure, may be associated with the increased incidence of leukemia. The neurotoxic effects have also been suggested as being associated with the leukoencephalopathy. Adverse effects on the neuroendocrine system have been shown to make subjects more susceptible to tuberculosis and pneumonia and may explain why the terminal events in some cases of leukemia infestation may be overwhelming infections. Reported acute sublethal - tendency toward inhibition of lymphoid neoplasms. Rats exhibited an increased incidence of neoplasms, mainly sarcomas, at various sites. Mammary duct carcinomas have been reported more frequently in exposed women. Testicular damage has been reported in rats, rabbits and rhesus monkeys. Some animal studies have demonstrated endocrinologically sensitive at levels as low as 10 ppm and the potential for neurotoxic effects such as decreased body weight and skeletal maturity have also been shown. Other studies have not yet noted any alterations or untoward effects.

SKIN CONTACT: ACUTE EXPOSURE

GASOLINE, AUTOMOTIVE UNLEADED: Liquid may cause irritation with erythema and pain. Prolonged or extensive contact may cause blistering and, in extreme cases epidermal necrosis. A 12-year-old boy partially covered in a pool of gasoline for 1 hour experienced hypotension, abnormal reflexes, decreased consciousness, rigidity, "wooden limbs", muscular and mental fatigue and an elevated serum amylase. Autopsy revealed cardiac edema, diffuse bilateral pneumonia, interstitial cardiac enlargement, toxic nephrosis, fatty infiltration of liver and peripancreatic fat necrosis.

HEXENE: Direct contact may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and edema. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. It may however, contribute to the toxicity from inhalation. Application to primate paws resulted in increased dermal permeability.

CHRONIC EXPOSURE

GASOLINE, AUTOMOTIVE UNLEADED: Repeated or prolonged contact with the liquid may cause irritation, dermatitis and defolting of the skin with drying and cracking or burns and blistering. Burns and blisters may develop hypersensitively, probably due to alcohols.

HEXENE: Repeated or prolonged contact defats the skin and may result in dermatitis with erythema, scaling, dryness, vasculature, and fissuring, possibly accompanied by paronychia of the fingers which may persist several weeks after the dermal is resolved. Peripheral neuritis has also been reported. Secondary infections may occur. Ticks on primate paws induce vasodilation is possible. Although several studies have failed to establish a relationship between skin contact and a carcinogenic effect, most of the studies were inadequate. Some papillomas and hemangioendothelial effects have been reported.

EYE CONTACT ACUTE EXPOSURE

GASOLINE, AUTOMOTIVE UNLEADED: Concentrations between 270 and 500 ppm may cause a sensation of irritation after brief exposure with an conjunctival hyperemia are visible. Liquid splashed on the eyes may cause pain, burning and slight transient corneal epithelial disturbance. Hyperaemia and conjunctival hyperemia and edema may occur.

HEXENE: May cause irritation. Vapor concentrations of 3000 ppm are very irritating even on brief exposure. Complete corneal epithelial burning sensation, but only a slight, transient corneal epithelial injury with rapid recovery.

CHRONIC EXPOSURE

GASOLINE, AUTOMOTIVE UNLEADED: Repeated or prolonged exposure may cause conjunctivitis and possible corneal, or much less of corneal and conjunctival vasculature.

HEXENE: Repeated or prolonged exposure may cause conjunctivitis. In one study 100% of rats exposed to 50

gas for more than 600 hours developed catarrh.

INGESTION

ACUTE EXPOSURE

CAROLINE AUTOMOTIVE UNLEADED: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis and pulmonary edema. May cause irritation and burning of the gastrointestinal tract with nausea, vomiting and diarrhea. Absorption may cause initial central nervous stimulation followed by depression. Symptoms may include a mild excitation, weakness, incoordination, instability, twitching, weakness, flaccid veins, headache, dizziness, drowsiness, anorexia, nausea, vomiting, incoordination, convulsions and coma. Cardiac arrhythmias may occur. The most liver damage is possible. Signs of pulmonary involvement may include coughing, dyspnea, subnormal pulse, shallow development of rapid breathing, cyanosis, tachypnea and fever. Even small amounts may be fatal with death caused by cardiac arrest, asphyxia or respiratory paralysis. Depending on amount aspirated, death may occur rapidly or within 24 hours.



REGZONE: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis and pulmonary edema. May cause local irritation and burning sensation in the mouth, throat and stomach, and bronchospasm, reflexory lesions of the vocal or membranes in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, headache, dizziness, weakness, ataxic gait, chest pain and tightness, shallow rapid pulse and respiration, bronchospasm, pallor followed by flushing, and a death resulting death. There may be renal disturbances, transient convulsions, ventricular arrhythmias, and psychosis. Excitement, euphoria or delirium may precede weakness. Intoxication followed by stupor and unconsciousness, coma and death from respiratory failure. Those who survive the initial nervous system effects may develop headache, weakness, pulmonary edema, and intrapulmonary hemorrhage. The usual lethal dose in humans is 15-25 milliliters, but smaller amounts have been reported to cause death. A single exposure may produce long-term effects with parosymyria persisting up to a year.

CHRONIC EXPOSURE

CAROLINE AUTOMOTIVE UNLEADED: No data available.

REGZONE: Daily administration to humans of 3.5 grams as above caused headache, vertigo, shallow respiration, gastric distention, and evidence of renal congestion. In female rats treated with 100 mg/kg body dose over 107 days, no effects were observed at 1 mg/kg. There was slight leukopenia at 10 mg/kg and both leukopenia and anemia were seen at 50 and 100 mg/kg. Oral administration to rats and mice at various dose levels induced responses at multiple sites in males and females. In a one year prospective study, rats given 50 or 250 mg/kg, 6-8 days/week for 52 weeks did not exhibit any carcinogenic-type effects, but a dose correlated increase of leukemias and mammary carcinoma was observed. There were other tumor types also reported. Reproductive effects have been reported in animals.

13. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 302 Hazardous Waste Manifest or D011 Hazardous Waste Manifest or D011. Dispose of in accordance with U.S. EPA 40 CFR 302 for concentrations at or above the Regulatory level. Regulatory level: 0.5 mg/L.

14. TRANSPORT INFORMATION

SEA/BOAT/COAST GUARD

PROPER SHIPPING NAME: *Canadian*

UN NUMBER: UN1203

HAZARD CLASS OR DIVISION: 3

PACING GROUP: D

LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS

SHIPPING NAME: *Canadian*

UN NUMBER: UN1203

CLASS: 3

PACING GROUP/FORM: GROUP D

LAND TRANSPORT 408

PROPER SHIPPING NAME: *Canadian*

UN NUMBER: UN1203

CLASS: 3

CLASSIFICATION CODE: F1

PACING GROUP: E

LABELS: 3

LAND TRANSPORT 410

PROPER SHIPPING NAME: *Canadian*

UN NUMBER: UN1203

CLASS: 3

CLASSIFICATION CODE: F1

PACING GROUP: E

LABELS: 3

AIR TRANSPORT DATA

PROPER SHIPPING NAME: *Canadian*

UN/ID NUMBER: UN1203

CLASS OR DIVISION: 3

HAZARD LABELS: 3

PACING GROUP: E

AIR TRANSPORT 3140

PROPER SHIPPING NAME: *Canadian*

UN NUMBER: UN1203

CLASS OR DIVISION: 3

LABELS: 3

DE PACING GROUP: E

MARITIME TRANSPORT 1100

PROPER SHIPPING NAME: *Canadian*

UN NUMBER: UN1203

CLASS OR DIVISION: 3

PACING GROUP: E

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA SECTIONS 101-103 HAZARDOUS SUBSTANCES (40 CFR 307.6)

Reactive SOLID HQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 302.60) Not regulated

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 304.60) Not regulated

SARA TITLE III SARA SECTIONS 302-303 HAZARDOUS CATEGORIES (40 CFR 309.10)

ACUTE: Yes

CHRONIC: Yes

POW: Yes

REACTIVE: No

SEVERE RELEASE: No

SARA TITLE III SECTION 303 (40 CFR 303.6)

Reactive

OSHA PROCESS SAFETY (29 CFR 1910.119) (Not regulated)

STATE REGULATIONS

California Proposition 65

Known to the state of California to cause the following

Reactive

Cancer (Feb 27, 1987)

Developmental toxicity (Dec 30, 1987)

Male reproductive toxicity (Dec 30, 1987)

CANADA'S REGULATIONS

WHMIS CLASSIFICATION Not determined

EUROPEAN REGULATIONS

EC CLASSIFICATION (ASSIGNED)

Xn	Harmful
	Carcinogen Category 2

EC Classification may be inconsistent with independently researched data.

HAZARDOUS SYMBOL



EC RISK AND SAFETY PHRASES

R 45	May cause cancer	
R 49	Harmful, may cause long damage to sensitive of	

- 5-42 In case of accident or if you feel unwell, seek medical advice immediately, show the label where possible)
- 5-50 Avoid exposure - obtain special instructions before use.

CONCENTRATION LIMITS

C=10% T R 43-43

O 1%+C=10% T R 43

NATIONAL INVENTORY STATUS

U.S. INVENTORY (TSCA) *Included on inventory*

TSCA CAN EXPORT NOTIFICATION *Notified*

16. OTHER INFORMATION

MERCHANDISE CHARGES

EXPLOSIVE CONTROLS PERSONAL PROTECTION

©Copyright 1994-2008 MLL Information Systems Inc. All rights reserved

1.6 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MOBI INFORMATION SYSTEMS, INC.

1281 Woodchuck Road, Suite 200
Buckeye, TX 77517-3433
1 813 366-3600

EMERGENCY TELEPHONE NUMBER

1 800-424-8096 (NORTH AMERICA)
1 702-587-0497 (INTERNATIONAL)

SUBSTANCE: BENZENE

TRADE NAME(S) / SYNONYM(S)

BENZOL, CYCLOHEXATRIENE, BENZOLE, PHENE, PYRAHENEOL, PYROBENZOLE, CARBON OIL,
COAL TAR NAPHTHA, PHENYL HYDRIDE, BENZOLINE, BISACRYLATE OF HYDROGEN COAL,
NAPHTHA, INDYOL, BENZOL, AROMATOL, MINERAL NAPHTHA, (HYDROCARBON, PETROLIUM,
PETROLEUM, SOLA OILS, UNITHA, CHEM, CHEMIST, STRECH, CYHAXONE)

CHEMICAL FAMILY: *hydrocarbon aromatic*

CREATION DATE: Oct 11 1994
REVISION DATE: Mar 19 2007

2. COMPOSITION INFORMATION ON INGREDIENTS

CONFORMANT: BENZENE

CAS NUMBER: 71-43-2
EC NUMBER (EINECS): 200-753-7
EC INDEX NUMBER: 603-003-00-6
PERCENTAGE: 100

OTHER CONTAMINANTS:

0.1% BENZYLALCOHOL, 1 PPM THIOPHENE

3. HAZARDS IDENTIFICATION

9PPH, RATING(S): SCALE 0-9+ HEALTH=0 FUD=0 REACTIVITY=0

EMERGENCY OVERVIEW:

COLORED: colorless to yellow

PHYSICAL FORM: liquid

ODOR: faintest odor

MAJOR HEALTH HAZARDS: *potentially fatal on contact with the skin, respiratory tract irritation, skin
irritation, eye irritation, aspiration hazard, blood damage, central nervous system depression, cancer hazard (as
benzene)*

PHYSICAL HAZARDS: *Extremely flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges
may be generated by flow, agitation, etc.*

POTENTIAL HEALTH EFFECTS IRRITATION:

SHORT TERM EXPOSURE irritates, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, drowsiness, drowsiness, sleep disturbances, nasal congestion, weakness, loss of consciousness, blurred vision, lung congestion, internal bleeding, blood disorders, purpura, coma.

LONG TERM EXPOSURE changes in body temperature, changes in blood pressure, nausea, stomach pain, loss of appetite, difficulty breathing, irregular heartbeat, headache, dizziness, drowsiness, emotional disturbances, loss of consciousness, hearing loss, visual disturbances, menstrual disorders, blood disorders, liver disorders, reproductive effects, brain damage, cancer.

SKIN CONTACT

SHORT TERM EXPOSURE potentially fatal on contact with the skin, irritation.

LONG TERM EXPOSURE irritation, allergic reactions, burning sensation.

EYE CONTACT

SHORT TERM EXPOSURE irritation.

LONG TERM EXPOSURE irritation.

INGESTION

SHORT TERM EXPOSURE irritates, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, drowsiness, drowsiness, emotional disturbances, nasal congestion, weakness, loss of consciousness, blurred vision, lung congestion, internal bleeding, purpura, neurotoxicity, coma, aspiration, hazard.

LONG TERM EXPOSURE nausea, vomiting, diarrhea, headache, dizziness, irritability, kidney damage, cancer.

CARCINOGEN STATE

GENA: Yes.

MTS: Yes.

ASC: Yes.

4. FIRST AID MEASURES

DECONTAMINATION: If at all, avoid effects occur: remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomit has occurred, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

NOTE TO FIRST AID: For inhalation, administer oxygen.

5. FIRE FIGHTING MEASURES

FLAME AND EXPLOSION HAZARD: Serious fire hazard. Moderate explosion hazard. Vaporizer reactions are explosive. The vapor is heavier than air. Vapor or gases may ignite at elevated system pressures and flash back. Electrostatic discharges may be generated by fire or explosion resulting in ignition or explosion.

EATING/DRINKING MEDIA: regular dry chemical, carbon dioxide, water, regular foam.

Leakage from the regular foam or fixed with fire water spray.

FIRE FIGHTING² Move container from fire area if it can be done without risk. Cool container with water spray until well after the fire is out. Stay away from the walls of tanks. For fires in cargo or storage area, Cool container with water from underneath. Use a holder or concrete bunker until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any decomposition of tanks due to fire. For tanks, rail car or tank truck, Evacuation radius: 100 meters (1/2 mile). Water may be ineffective.

FLASH POINT 129°F (54°C)
LOWER FLAMMABLE LIMIT 1.2%
UPPER FLAMMABLE LIMIT 7.9%
AUTO IGNITION 129°F (54°C)
FLAMMA SELECT CLASS (GHS) 3

6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE

Reduce vapors with water spray. Stay upwind and keep out of flow areas.

SOIL RELEASE

Do not hold any area such as lagoons, pond or pit line contaminated. Take for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE

Cover with absorbent slabs, spill-control pads or pillows. Apply d-tergents using alcohol or another suitable active agent. Collect with absorbent into suitable container. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1987 (Proposition 65): It may contain water supplies and streams.

OCCUPATIONAL RELEASE

Avoid heat, flames, sparks and other sources of ignition. Stay back if possible without personal risk. Reduce vapors with a steamship. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Take for later disposal. Remove sources of ignition. If any unnecessary people are in or near hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than reported to RC (U.S. EPCRA Section 304). If release occurs in the U.S. and is reportable under CERCLA, Section 103, notify the National Response Center at 1-800-424-9363 (USA) or 1-813-426-5875 (USA &).

7. HANDLING AND STORAGE

STORAGE Store and handle in accordance with all relevant regulations and standards. Protect from physical damage. Store in bulk in a detached building. Store in all flammable liquids Subject to storage regulations. U.S. OSHA 29 CFR 1910.106 Consulting and handling required. Keep segregated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS

PERMISE

1 ppm OSHA TWA

1 ppm OSHA STEL 15 minutes

10 ppm OSHA action level

10 ppm OSHA TWA (aggravates and entry even greater because critical and 100% 100%)

55 ppm OSHA ceiling (applies to industry except from benzene standard 1000 1000)
50 ppm OSHA peak 10 minute(s) (applies to industry except from benzene standard 1000 1000)
0.5 ppm ACGIH TWA (skin)
2.5 ppm ACGIH STEL (skin)
0.1 ppm NIOSH recommended TWA 10 hours(s)
1 ppm NIOSH recommended STEL
DPO MAE (extremely dangerous)
3.25 mg/m³ (1 ml/m³) ACG TWA (effective 1 Jan 2005 no longer valid per amendment)
3.25 mg/m³ (1 ppm) SC OEL TWA (skin) (ACGIH)
1 ppm UK WEL TWA (skin)

MEASUREMENT METHOD: NIOSH TV-81000 1001 3700 3800 OSHA 12 1000

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ventilation equipment should be explosion-protected if explosive concentrations of material are present.

EYE PROTECTION: Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench/shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves. **OSHA REGULATED SUBSTANCES:** US OSHA 20 CFR 1000 1000

RESPIRATOR: The following respirators and maximum air concentrations are listed from NIOSH and/or OSHA.

10 ppm

Any air-purifying respirator with a full facepiece and an organic vapor cartridge

10 ppm

Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)

Any air-purifying respirator with a full facepiece and a cartridge providing protection against the substance

100 ppm

Any powered air-purifying respirator with a high-flow facepiece and organic vapor cartridge(s)

1000 ppm

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

For Solvents: Concentrations as Immediately Dangerous to Life or Health

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in coordination with a separate escape supply

Example:

Any air-purifying respirator with a full facepiece and an organic vapor cartridge

Any self-contained breathing apparatus with a full facepiece

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

COLOR: colorless to yellow

SMELL: distinct odor

MOLECULAR WEIGHT: 78.11

MOLECULAR FORMULA: C₆H₆

BOILING POINT: 176.3 (60 C)

FREEZING POINT: -43.7 (5 C)

VAPOR PRESSURE: 23 mmHg @ 20 C

VAPOR DENSITY: Gas=10.2

SPECIFIC GRAVITY: (water=1) 0.8925 @ 20 C

WATER SOLUBILITY: 0.18% @ 20 C

PI: Not available

VOLATILITY: 80%

ODOR THRESHOLD: 4-60 ppm

EVAPORATION RATE: 3.1 (ethyl acetate=1)

VISCOSITY: 0.44 cP @ 20 C

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: acetone, alcohol, ether, diethyl ether, carbon tetrachloride, chloroform, acetic acid, oil, organic solvents

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressures.

CONDITIONS TO AVOID: A void heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Stay out of water supplies and sewers.

INCOMPATIBILITIES: acids, bases, halogens, oxidizing materials, metal salts

REAGENTS

ACIDS (STRONG): Incompatible

ALKYL CHLORIDE WITH DI-CHLOROETHYL ALUMINUM OR ETHYLALUMINUM DICHLORIDE: Possible explosion.

ARSENIC PENTAFLUORIDE + POTASSIUM METHOXIDE: Explosive interaction.

BASES (STRONG): Incompatible

BROMINE + IRON: Incompatible

BROMINE PENTAFLUORIDE: Fire- and explosion- based.

BROMINE TRIFLUORIDE: Possible explosion or ignition.

CHLORINE: Explosive in the presence of light.

CHLORINE TRIFLUORIDE: Violent reaction with possible explosion.

CHROMIC ANHYDRIDE (POWDERED): Ignites.

CHROMIUM: Spontaneously-explosive reaction in air.

DIATYGEN DIFLUORIDE: Ignites, even at normal temperatures.

DIOXYGENYL TETRAFLUOROBORATE: Ignition reaction.

INTERHALOGEN COMPOUNDS: Ignition or explosion.

IODINE HEPTAFLUORIDE: Ignites on contact.

IODINE PENTAFLUORIDE: Violent interaction above 30 C.

NITRIC ACID: Violent or explosive unless properly agitated and cooled.

NITRYL PERCHLORATE: Explosive interaction.

OXIDIZERS (STRONG): Fire- and explosion- based.

OXYGEN (LIQUID): Explosive reaction.

OXONE: Formation of explosive peroxides possible.

PERCHLORATES (METAL): Formation of explosive complex.

PERCHLORATE FLUORIDE + ALUMINUM CHLORIDE: Formation of shock sensitive compound.

PERMANGANATE + SULFURIC ACID: Possible explosion.

PERMANGANIC ACID: Explosive- based.

PEROXODISULFURIC ACID: Explosive- based.

PER-OXOMONOSULFONIC ACID Epoxide activators.
POTASSIUM PEROSULFATE Epoxides.
SILVER PEROXOLATE Trioxetane of epoxide complex
SODIUM PEROXIDE 4-WATER Ignition.
URANIUM HEXAFLUORIDE Fuel element.

HAZARDOUS DECOMPOSITION

Thermal decomposition products: oxides of carbon.

POLYMERIZATION Will not polymerize

11. TOXICOLOGICAL INFORMATION

REMARKS-

IRRITATION BATA: 15 mg/24 hour(s) open skin-ndt mild. 25 mg/24 hour(s) skin-ndt moderate. 50 mg
eye-ndt moderate. 2 mg/24 hour(s) eye-ndt severe. 50 mg/24 hour(s) open skin-ndt mild.
TD₀₁ (C₅₀) BATA 2 g/kg/5 month(s) inhalation-human LC₅₀ 50 mg/kg oral rat LC₅₀ 150 ppm/7 year(s)
intermittent inhalation-mouse TC₁₀ 100 ppm inhalation-human TC₁₀ 15 mg/kg/5 year(s) inhalation-human LC₁₀
154 mg/kg subcutaneous rat LC₁₀ 500 mg/kg oral rat LD₅₀ 10000 ppm/7 hour(s) inhalation-mouse LC₅₀ 1160 mg/kg
subcutaneous-rat LD₅₀ 4700 mg/kg subcutaneous LD₅₀ 1000 ppm inhalation-mouse LC₅₀ 48 mg/kg skin-mouse
LD₅₀ 340 mg/kg subcutaneous-mouse LD₅₀ 2 g/kg oral dog LC₁₀ 100000 mg/kg inhalation-dog LC₁₀
170000 mg/kg inhalation-rat LC₁₀ 45000 ppm/50 month(s) inhalation-mild LC₁₀ 70-800 mg/kg skin-ndt
LD₅₀ 88 mg/kg skin-mouse mild LC₁₀ 10400 mg/kg skin-pig rat LD₅₀ 100 mg/kg subcutaneous-pig rat
pg LC₁₀ 1400 mg/kg subcutaneous dog LC₁₀ 1700 mg/kg subcutaneous LD₅₀ 20000 ppm/5 month(s)
inhalation-normal LC₁₀ 1500 mg/kg subcutaneous-normal LC₁₀ 3 mg/kg subcutaneous rat LC₁₀ 160
mg/kg/12 hour(s) oral rat, rat TC₁₀ 4000 ppm inhalation-rat TC₁₀ 10000 ppm inhalation-rat LC₁₀ 20000
ppm/25 month(s) inhalation-mild LC₁₀ 0.1 mg/kg subcutaneous-rat LC₁₀ 1 mg/kg oral-rat LD₅₀ 1000
mg/kg oral-rat LD₅₀ 15 mg/kg/2 hour(s) inhalation-mouse LC₁₀ 16.7 ppm/24 hour(s) inhalation-rat TC₁₀ 30
mg/kg/24 hour(s) inhalation-human TC₁₀ 70 mg/kg/24 hour(s) inhalation-human TC₁₀ 2 ppm/2 month(s)
inhalation-human LC₁₀ 3 mg/kg/24 hr. rat inhalation-human LC₁₀ 0.7 mg/kg oral-human LC₁₀ 2000 ppm/30
month(s) inhalation-mouse TC₁₀ 3010 ppm/30 month(s) inhalation-mouse TC₁₀ 1 ppm/7 hour(s) inhalation-rat
TC₁₀ 100 mg/kg/12 hour(s) skin-rat TC₁₀ 0-50 mg/kg skin-rat TC₁₀ 4000 mg/kg oral rat LD₅₀ 1200 mg/kg oral-
rat TC₁₀ 120 mg/kg oral-rat TC₁₀ 4000 mg/kg/57 week(s) intratracheal-rat TC₁₀ 20 mg/kg/24 hour(s)-3
day(s) intratracheal inhalation-rat TC₁₀ 500 ppm/6 hour(s)-13 week(s) intratracheal inhalation-rat TC₁₀ 500 ppm/6
hour(s)-70 week(s) intratracheal inhalation-rat TC₁₀ 17 ppm/kg/17 week(s) intratracheal oral-rat TC₁₀ 1000 ppm/7
hour(s)-20 week(s) intratracheal inhalation-rat TC₁₀ 500 ppm/6 hour(s)-3 week(s) intratracheal inhalation-rat
TC₁₀ 12 mg/kg/5 week(s) intratracheal inhalation-mouse TC₁₀ 10 mg/kg/21 day(s) intratracheal inhalation-mouse-rat
TC₁₀ 2100 mg/kg/5 day(s) intratracheal subcutaneous-rat TC₁₀ 12000 mg/kg/12 week(s) intratracheal
subcutaneous-rat TC₁₀ 5 mg/kg/10 day(s) intratracheal subcutaneous-rat TC₁₀ 4200 mg/kg/17 week(s)
intratracheal oral-mouse TC₁₀ 300 ppm/6 hour(s)-13 week(s) intratracheal inhalation-mouse TC₁₀ 25 ppm/6
hour(s)-5 day(s) intratracheal inhalation-mouse TC₁₀ 15 ppm/6 hour(s)-10 week(s) intratracheal inhalation-mouse-
TC₁₀ 10 ppm/6 hour(s) 20 week(s) intratracheal inhalation-mouse TC₁₀ 211 ppm/6 hour(s)-7 day(s) intratracheal
and mouse TC₁₀ 300 ppm/6 hour(s)-10 week(s) intratracheal inhalation-mouse TC₁₀ 40 ppm/6 hour(s)-14 day(s)
intratracheal inhalation-mouse TC₁₀ 2100 mg/kg/5 day(s) intratracheal subcutaneous mouse TC₁₀ 100 ppm/6
hour(s)-75 week(s) intratracheal inhalation-mouse TC₁₀ 300 mg/kg/25 hour(s)-13 week(s) intratracheal inhalation-
mild TC₁₀ 100 ppm/6 hour(s)-3 week(s) intratracheal inhalation-pig TC₁₀ 320.5 mg/kg/4 week(s) cutaneous
and mouse TC₁₀ 100.4 mg/kg/7 day(s) cutaneous oral-mouse TC₁₀ 4000 mg/kg/9 day(s) intratracheal
subcutaneous-mouse TC₁₀ 7.8 mg/kg/12 week(s) intratracheal subcutaneous-rat TC₁₀ 100 ppm/6 hour(s)-12
week(s) intratracheal subcutaneous TC₁₀ 11.72 mg/kg/12 week(s) intratracheal inhalation-rat TC₁₀ 100 ppm/7
week(s) intratracheal inhalation-mouse TC₁₀ 100.8 mg/kg/13 day(s) intratracheal subcutaneous-rat TC₁₀ 24.97
mg/kg/2 day(s) intratracheal subcutaneous-rat TC₁₀ 50 ppm/6 hour(s)-14 day(s) intratracheal inhalation-mouse-
TC₁₀ 100 ppm/6 hour(s)-14 day(s) intratracheal inhalation-mouse TC₁₀ 200 ppm/26 week(s) intratracheal

[illegible]

CARCINOGEN STATES: OSHA, Category III; known Human Carcinogen, IARC, Human Proliferative Defective, Animal Proliferative Defective, Group I. ACGIH, A1 - Confirmed Human Carcinogen, EC, Category I. TRUTH DATE: 8-1

Plasmodium coxi, sporadic and common form, represented a independent *p* heterozygous response to leishman and the occurrence of various types of leishmaniasis. Several case-control studies have also shown increased odds ratios for exposure to leishman. Individual responses *p*-status and poorly defined responses render their interpretation difficult. These case-control cohort studies have demonstrated an increased incidence of acute necrotizing febrile leishmaniasis as we have observed in leishmaniasis.

1. *Journal of the American Medical Association*, 2000; 284: 1039-1044.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

[illegible]

Wiley-Blackwell | www.wiley.com

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

1. *Journal of the American Medical Association*, 1997; 277: 1039-1043.

© 2005 Blackwell Publishing Ltd *Journal of Internal Medicine* 258: 103–110

MEDICAL CONDITIONS ASSOCIATED BY ICD-9-CM blood system classification: nervous system
Location: 23-24-25[illegible][illegible]

subcutaneous 2000 mg/kg cytochrome c analysis - subcutaneous 2000 mg/kg 15 weeks interval test, cytochrome analysis - subcutaneous 2000 mg/kg 12 days interval test, cytochrome analysis - subcutaneous 2000 mg/kg cytochrome analysis - intral 20000 mg/kg sister chromatal exchange - subcutaneous 5 ppm 4 hour si sister chromatal exchange - subcutaneous 1 mmol/L, micronucleus test - mouse onlay 22500 mm/L, micronucleus test - mouse subcutaneous 440 mg/kg micronucleus test - mouse onl 40 mg/kg micronucleus test - mouse intraperitoneal 204 mg/kg 24 hours micronucleus test - mouse subcutaneous 10 ppm 5 hours si mutation in mammalian somatic cells - mouse lymphocyte 12500 ng/L 1-48H mutation in mammalian somatic cells - mouse onlay 2000 ng/L 1-48H morphological transformation - mouse onlay 1 g/L morphological transformation - mouse 5 mmol/L 100 g/L DNA damage - mouse lymphocyte 2040 mm/L DNA at rest - mouse intraperitoneal 2040 mg/kg 2-4 g/L 5-contraction - sister mutation test systems - mouse onl 2 g/kg - sister mutation test systems - mouse onlay 100 g/L 5 mmol/L DNA inhibition - mouse onl 20 g/kg - sister mutation test systems - mouse lymphocyte 10 mmol/L DNA inhibition - mouse intraperitoneal 100 mg/kg DNA inhibition - mouse subcutaneous 2000 ppm 4 hour si-contraction DNA inhibition - mouse onlay 2 mmol/L sister chromatal exchange - mouse subcutaneous 10 ppm 5 hours sister chromatal exchange - mouse intraperitoneal 20 g/kg cytochrome analysis - mouse onl 20 mg/kg cytochrome analysis - mouse intraperitoneal 204 mg/kg 3 days si-contraction cytochrome analysis - mouse subcutaneous 2000 ppm, dominant lethal test - mouse onl 1 mg/kg dominant lethal test - mouse intraperitoneal 5 mg/kg mutation in mammalian somatic cells - mouse lymphocyte 12500 ng/L mutation in mammalian somatic cells - mouse subcutaneous 40 ppm 5 weeks contraction mutation in mammalian somatic cells - mouse onl 2 g/kg 5 days-contraction morphological transformation - hamster onlay 100 ng/L DNA damage - hamster onlay 17 mmol/L cytochrome analysis - hamster onlay 500 ng/L cytochrome analysis - hamster onlay 400 ng/L sister chromatal exchange - hamster onlay 750 ng/L sex chromosomes loss and non-disjunction - hamster onlay 22500 ng/L sex chromosomes loss and non-disjunction - hamster onlay 22 mmol/L mutation in mammalian somatic cells - hamster onlay 10 mmol/L DNA damage - sister subcutaneous 2044 mg/kg DNA inhibition - sister subcutaneous 3 g/kg - sister mutation test systems - sister hamster 1 mmol/L - sister mutation test systems - rat hamster 1 mmol/L cytochrome analysis - male subcutaneous 2400 mg/kg DNA damage - mouse intraperitoneal 2000 mg/kg DNA damage - mouse onl 2000 mg/kg micronucleus test - mouse subcutaneous 12000 ppm 3 weeks cytochrome analysis - mouse onl 3 g/kg morphological transformation - mouse hamster 0.05 mg/kg 1200 20 days si cytochrome analysis - rat subcutaneous 7.5 mg/kg 12 weeks interval test, micronucleus test - rat intraperitoneal 0.05 mg/kg micronucleus test - rat subcutaneous 0.05 mg/kg micronucleus test - non-mammalian species onlay 10 mg/L 30 hours micronucleus test - non-mammalian species onlay 10 mg/L 30 hours DNA at rest - mouse intraperitoneal 2000 mg/kg 3 days si sister test, micronucleus test - mouse subcutaneous 100 ppm 5 hours si 12 weeks interval test, micronucleus test - mouse subcutaneous 100 ppm 2 weeks si-contraction test, DNA at rest - rat intraperitoneal 0.5 mg/kg 1 day si DNA at rest - mouse intraperitoneal 0.5 mg/kg 1 day si cytochrome analysis - hamster subcutaneous 0.1 ppm, micronucleus test - hamster subcutaneous 22 ng/L 5 years si-contraction test, micronucleus test - mouse subcutaneous 10 ppm 5 days si-contraction test, micronucleus test - mouse subcutaneous 10 ppm 2 weeks si DNA damage - mouse subcutaneous 100 ppm 2 weeks si-contraction test - mouse intraperitoneal 10 mg/kg cytochrome analysis - mouse intraperitoneal 24 mg/kg

REPRODUCTIVE EFFECTS DATA - 470 mg/kg subcutaneous - rat T4Lo/24 hours si 15 days/100 ppm pregnancy 22 days/100 ppm pregnant female-contraction - 20400 mg/kg subcutaneous - rat T4Lo/24 hours/100 ppm pregnant female-contraction - 20 ppm subcutaneous - rat T4Lo/24 hours/100 ppm pregnant female-contraction - 100 ppm subcutaneous - rat T4Lo/24 hours si 7-14 days/100 ppm pregnant female-contraction - 3 g/kg oral-mouse T4Lo 6-12 days/100 ppm pregnant female-contraction - 12 g/kg oral-mouse T4Lo 6-12 days/100 ppm pregnant female-contraction - 1000 mg/kg oral-mouse T4Lo 6-12 days/100 ppm pregnant female-contraction - 10000 mg/kg oral-mouse T4Lo 6-12 days/100 ppm pregnant female-contraction - 200 ppm subcutaneous-mouse T4Lo/7 hours/100 ppm pregnant female-contraction - 200 mg/kg subcutaneous-mouse T4Lo/12 hours/100 ppm pregnant female-contraction - 3 ppm subcutaneous-mouse T4Lo 6-12 days/100 ppm pregnant female-contraction - 20 ppm subcutaneous-mouse T4Lo/7 hours/100 ppm pregnant female-contraction - 20 mg/kg intraperitoneal-mouse T4Lo 1 days/100 ppm pregnant female-contraction - 1000 mg/kg subcutaneous-mouse T4Lo 12 days/100 ppm pregnant female-contraction - 1000 mg/kg subcutaneous-mouse T4Lo 12-13 days/100 ppm pregnant female-contraction - 12500 mg/kg intramuscular-mouse T4Lo 12-13 days/100 ppm pregnant female-contraction - 4 g/kg parenteral-mouse T4Lo 12-13 days/100 ppm pregnant female-contraction - 1 g/kg subcutaneous-mouse T4Lo/24 hours/100 ppm pregnant female-contraction - 1 g/kg subcutaneous-mouse T4Lo/24 hours/100 ppm pregnant female-contraction - 1000 ppm subcutaneous-mouse T4Lo/7 hours/100 ppm pregnant female-contraction - 1000 mg/kg intraperitoneal-mouse T4Lo 10-11 days/100 ppm pregnant female-contraction

months of diagnosis. Exposure usually acts as an initial response, including non-dose-dependent effects, and the finding of monoclonality suggests that, in some cases, the blood dyscrasia may partially be an allergic reaction. Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but most of exposure patterns and poorly defined exposures render these interpretations difficult. Three independent cohort studies have demonstrated an increased incidence of acute myeloid leucemia in workers exposed to benzene. Several studies have also suggested a link between occupational exposure and multiple myeloma and lymphoma, both B-cell type and T-cell type. Although splenic anemia is probably the most likely consequence of long-term exposure, it is not sufficient for an official statement that, to go through a pre-leukemic phase into frank leukemia. Conversely, leukemia, without preceding splenic anemia can occur. In one study the range of time from the start of the exposure to the diagnosis of leukemia, was 3-26 years. It has been suggested that the chromosomal alterations which are seen in peripheral blood and bone marrow cells and persist for a long time after exposure ceases, may be associated with the increased incidence of leukemia. The immunosuppressive effect has also been suggested as being associated with the leukemogenesis. Adverse effects on the immunological system have been shown to make subjects more susceptible to tuberculosis and pneumonia, and may explain why the terminal event in some cases of benzene intoxication may be overwhelming infection. Exposed mice exhibited a tendency toward inhibition of lymphoid myeloma. Rats exhibited an increased incidence of myelomas, mainly occurring at various sites. Myelofibrotic leukemias have been reported more frequently in exposed women. Testicular damage has been reported in rats with low and human data. Some animal studies have demonstrated endocrinologically sensitive at levels as low as 10 ppm and the potential for endocrine effects such as decreased body weight and skeletal maturity have also been shown. Other studies have not produced any abnormalities in endocrinology.

SKIN CONTACT

ACUTE EXPOSURE

HEXENE Direct contact may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and ulcers. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. It may however, contribute to the toxicity from inhalation. Application to primate paps resulted in increased dermal permeability.

CHRONIC EXPOSURE

HEXENE Repeated or prolonged contact defile the skin and may result in dermatitis with erythema, scaling, dryness, vasculature, and burning, possibly accompanied by paronychia of the fingers which may persist several weeks after the dermal contact ceases. Peripheral neuritis has also been reported. Secondary infections may occur. Tests on primate paps indicate sensitization is possible. Although several studies have failed to establish a relationship between skin contact and a carcinogenic effect, most of the studies were inadequate, some papillomas and hemolytic effects have been reported.

EYE CONTACT

ACUTE EXPOSURE

HEXENE May cause irritation. Vapor concentrations of 2000 ppm are very irritating even on brief exposure. Irritation cause a transient burning sensation, but only a slight, transient normal epithelial injury with rapid recovery.

CHRONIC EXPOSURE

HEXENE Repeated or prolonged exposure may cause conjunctivitis. In one study 50% of rats exposed to 50 ppm for more than 600 hours developed conjunctivitis.

INGESTION

ACUTE EXPOSURE

HEXENE Long duration may cause if ingested into the lungs and may include symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause local irritation and burning sensation in the mouth, throat, and stomach, and hemorrhagic inflammation of the mucous membranes in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, head-ache, dizziness, weakness.

staggering chest pain and tightness, shallow nasal pain and respiratory, bronchial and pulmonary pain followed by flushing and a loss of respiratory effort. There may be renal disturbances, tremor, convulsions, ventricular irregularities and paralysis. Excitement, euphoria, arrhythmias may precede weakness, fatigue, sleepiness and followed by stupor and unconsciousness, coma and death from respiratory failure. Those who survive the central nervous system effects may develop bronchitis, pneumonia, pulmonary edema, and intrapulmonary hemorrhage. The usual lethal dose in humans is 10-15 milliliters, but smaller amounts have been reported to cause death. A single exposure may produce long term effects with paralytic effects persisting up to a year.

CHRONIC EXPOSURE

SYMPTOMS: Daily administration to humans of ≥ 3 grams (average of usual headache, vertigo, bladder irritability, impotence, gastric disturbances, and weakness of nasal respiration). In female rats treated with 132 mg/kg body dose over 117 days, no effects were observed at 1 mg/kg. There was slight leukopenia at 10 mg/kg and both leukopenia and anemia were seen at 50 and 100 mg/kg. Oral administration to rats and rhesus monkeys dose levels produced neoplasms at multiple sites in males and females. In a one year pyramidal study, rats given 50 or 200 mg/kg, 6-5 days/week for 52 weeks did not exhibit carcinogenic tumor effects, but a dose correlated increase of leukemias and mammary carcinomas was observed. There were other tumor types also reported. Reproductive effects have been reported in animals.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA

FISH TOXICITY: 1000 ug/L, 96 hours (LC50) (Mortality) Rainbow trout, dandelion, bass (Daphnophorus erythrus)

INVERTEBRATE TOXICITY: 10000 ug/L, 48 hours (LC50) (Immobilization) Water flea (Daphnia magna)

AQUATIC TOXICITY: 40000 ug/L, 96 hours (LC50) (Copepod) Copepod, algae (Solenastrea capricornensis)

OTHER TOXICITY: 20 ug/L, 24 day(s) (Hemolysis) Wood frog (Stora erythraea)

FATE AND TRANSPORT

KOW: 10000 (log = 4.00) (estimated from water solubility)

KOW: 11104.26 (log = 4.05) (estimated from water solubility)

HEXET'S LAW CONSTANT: 4.0 E - 3 (size-related)

BIOCONCENTRATION: 4000 mg/L, 24 days (BCF) (Rainbow) Northern anchovy (Engraulis mordax) 57 ug/L

AQUATIC PRECIPITATION: 2.0E+0000 hours (River Model) 1 in deep 1 m/s flow 3 m/s wind

ENVIRONMENTAL SIGNALET: Relatively non-persistent in the environment. Not expected to leak through the soil or the sediment. Accumulates very little on the bodies of living organisms. Highly soluble from water.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations, U.S. EPA 40 CFR 302 Hazardous Waste Manifest or 130.65 Hazardous Waste Manifest or D018. Dispose of in accordance with U.S. EPA 40 CFR 302 for concentrations at or above the regulatory level. Regulatory level: 0.3 ug/L.

14. TRANSPORT INFORMATION

SEA/BOAT AIRPORT TRANSIT

PROPER SHIPPING NAME *(Required)*

ID NUMBER UN1114

HAZARD CLASS OR DIVISION 3

PACKING GROUP II

LABELING REQUIREMENTS 3

CANADIAN TRANSPORTATION OF PASSENGER GOODS

PROPER SHIPPING NAME *(Required)*

ID NUMBER UN1114

CLASS 3

PACKING GROUP/REG. GROUP II

LAND TRANSPORT ADR

PROPER SHIPPING NAME *(Required)*

ID NUMBER UN1114

CLASS 3

CLASSIFICATION CODE (F)

PACKING GROUP II

LABEL 3

LAND TRANSPORT RID

PROPER SHIPPING NAME *(Required)*

ID NUMBER UN1114

CLASS 3

CLASSIFICATION CODE (F)

PACKING GROUP II

LABEL 3

AIR TRANSPORT DATA

PROPER SHIPPING NAME *(Required)*

ID/ID NUMBER UN1114

CLASS OR DIVISION 3

HAZARD LABELS 3

PACKING GROUP II

AIR TRANSPORT ICAO

PROPER SHIPPING NAME *(Required)*

ID NUMBER UN1114

CLASS OR DIVISION 3

LABEL 3

DE PACKING GROUP II

MARITIME TRANSPORT IMDG

PROPER SHIPPING NAME *(Required)*

ID NUMBER UN1114

CLASS OR DIVISION 3

PACKING GROUP II

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA SECTIONS 101-106 HAZARDOUS SUBSTANCES (40 CFR 303-308)

Reactive SOLID No

SAHA TITLE III SECTION 303 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303-308) No regulated

SAHA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303-308) No regulated

SAHA TITLE III SARA SECTIONS 302-303 HAZARDOUS CATEGORIES (40 CFR 303-310)

ACUTE Yes

CHRONIC Yes

FIRE Yes

REACTIVE No

STABLE RELEASE No

SAHA TITLE III SECTION 305 (40 CFR 311-315)

Reactive

OSHA PROCESS SAFETY (29 CFR 1910.119) Not regulated

STATE REGULATIONS

California Proposition 65

Known to the state of California to cause the following

Reactive

Cancer (Feb 27, 1987)

Developmental toxicity (Dec 28, 1987)

Male reproductive toxicity (Dec 28, 1987)

CANADIAN REGULATIONS

WHMIS CLASSIFICATION Not determined

EUROPEAN REGULATIONS

EC CLASSIFICATION (ASSIGNED)

F	Highly Flammable
T	Toxic
Xn	Harmful
Xn	Irritant
	Corrosive Category 1
	Marine Category 2

EC Classification may be inconsistent with independently assessed data.

DAKOR/HAZARD SYMBOL

EC RISK AND SAFETY PHRASES

R 11	Highly flammable
R 20/21	Irritating to eyes and skin.
R 22	May cause cancer
R 23	May cause harmful aquatic damage.
R 24/25	Very dangerous of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed
R 25	Harmful, may cause long damage if swallowed
S 42	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
S 53	Avoid exposure - obtain special instructions before use.

GERMAN REGULATIONS

WATER HAZARD CLASS (WG)

STATE OF CLASSIFICATION: Very bad

CLASSIFICATION UNDER HAZARD TO WATER: 3

NATIONAL INVENTORY STATUS

U.S. INVENTORY (TSCA): Listed as secondary

TSCA 2001 EXPORT NOTIFICATION: Not listed

16. OTHER INFORMATION

MARK SUMMARY OF CHANGES

II. TOXICOLOGICAL INFORMATION

©Copyright 1994 DOW NIEL Information Systems Inc. All rights reserved

1.7 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSD INFORMATION SYSTEMS, INC.

1295 Woodchuck Road, Suite 200
Nashville, TN 37217-3223
1-615-299-2000

EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH AMERICA)
1-703-927-3887 (INTERNATIONAL)

SUBSTANCE: TOLUENE

TRADE NAME(S)/SYNONYM(S)

METHYLBENZENE; 1-METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; TOLUOL; METHYL
BENZENE; TOLUENE; TOLNA; TOL; TOLU; C7H8; C6H5CH3; TICS; 155250000

CHEMICAL FAMILY: hydrocarbon aromatic

CREATION DATE: Oct 23 1994

REVISION DATE: Mar 15 2007

2. COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT: TOLUENE

CAS NUMBER: 108-98-3

EC NUMBER (EINECS): 203-428-8

EC INDEX NUMBER: 100-021-00-3

PERCENTAGE: 100

3. HAZARDS IDENTIFICATION

LETHAL RATING: SCALE 0-4: HEALTH=0 FUEL=0 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: colorless

PHYSICAL FORM: liquid

ODOR: faintest odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard - central nervous system depression, nerve damage

PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges may be generated by flow, agitation, etc.

POTENTIAL HEALTH EFFECTS:

IRRITATION:

SHORT TERM EXPOSURE: irritation, nausea, headache, drowsiness, dizziness, drowsiness, sleep disturbances, loss of coordination, dilated pupils, kidney damage, liver damage

LONG TERM EXPOSURE: irritation, possible cancer, vomiting, stomach pain, loss of appetite, dizziness, irregular heartbeat, headache, drowsiness, dizziness, drowsiness, difficulty speaking, sleep disturbances, hallucinations, mood swings, pain in extremities, tremors, loss of coordination, visual disturbances, dilated pupils

respiratory distress: irritant, burning. Blood function: kidney damage, liver damage, nerve damage, brain damage, coma.

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation.

LONG TERM EXPOSURE: irritation.

EYE CONTACT:

SHORT TERM EXPOSURE: irritation (possibly severe).

LONG TERM EXPOSURE: irritation.

INGESTION:

SHORT TERM EXPOSURE: irritation, nausea, stomach pain, headache, drowsiness, dizziness, disorientation,

slight disorientation, loss of coordination, diluted pupils, kidney damage, liver damage, aspiration hazard.

LONG TERM EXPOSURE: reproductive effects.

CARCINOGEN STATES

OSHA: 2b

NIH: No

IARC: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur: remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs: keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

5. FIRE FIGHTING MEASURES

FIRE AND/OR FLAMMABLE HAZARD: (Severe fire hazard). The vapors burn more than air. Vapors or gases may ignite at distant ignition sources and flash back. Vaporizer systems are explosive. Electrostatic discharges may be generated by fire or ignition resulting in ignition or explosion.

EXTINGUISHING MEDIA: regular dry chemical, carbon tetrachloride, water, regular foam.

Lump fires: Use regular foam or flood with low water spray.

FIRE FIGHTING: Move containers from fire area if storm is close without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area, Cool containers with water from unmanned, boom holder or monitor nozzles until well after fire is out. If this is impossible then take the following procedure: Keep unnecessary people away; isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of flames due to fire. For tank, rail car or tank truck, Evacuation radius: 300 meters (1/2 mile). Water may be ineffective.

FLASH POINT: 29°F (4°C) (100°)

LOWER FLAMMABLE LIMIT: 1.2%

UPPER FLAMMABLE LIMIT: 7.1%

6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE

Refuse vapors with water spray. Stop spread and keep out of low areas.

SOIL RELEASE

Do nothing area such as lagoons, pond or pit for containment. Take for later disposal. Absorb with sand or other non-combustible material. Collect with absorbent into suitable container.

WATER RELEASE

Absorb with absorbent cotton. Collect spilled material using mechanical equipment. Cover with absorbent sheets spill-control pads or pillows. Apply dehydrants, coagulants, absorbents or similar surface active agent. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1985 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE

A cool mist, fumes, vapors and other sources of exposure. Stop leak if possible without personal risk. Refuse vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Take for later disposal. Remove sources of exposure. If any unnecessary people may include removal area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release operator then arranged to RC (US EPA Section 304). If release occurs in the US and/or reportable under CERCLA Section 102, notify the National Response Center at (800)424-9303 (USA) or (202)426-5675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store in barrels in accordance with all relevant regulations and standards. Protect from physical damage. Store in tanks in a detached building. Store with flameable liquids. Store in a cool, dry place. Store in a tightly closed container. Follow the storage regulations. US OSHA 19 CFR 1910.106. Containing and handling required. Keep away from heat, open flame, substances.

8. EXPOSURE CONTROLS- PERSONAL PROTECTION

EXPOSURE LIMITS

TOXICITY:

200 ppm C6H6, TWA

300 ppm C6H6, ceiling

500 ppm C6H6, peak 15 minutes

100 ppm (377 mg/m³) C6H6, TWA (recommended by 50 FR 30330, June 30, 1985)

100 ppm (365 mg/m³) C6H6, STEL (recommended by 50 FR 30330, June 30, 1985)

50 ppm ACGIH, TWA (ideal)

100 ppm (375 mg/m³) NIOSH recommended TWA, 10 hours

750 ppm (260 mg/m³) NIOSH recommended STEL

100 mg/m³ (50 vol%) DPG MAM (peak limitation category II with maximum factor of 4) (extensive absorption, danger)

100 mg/m³ (50 ppm) EC OEL TWA (extensive absorption danger) (OELV)

200 mg/m³ (100 ppm) EC OEL STEL (extensive absorption danger) (OELV)

50 ppm (154 mg/m³) UK WEL TWA (ideal)

150 ppm (574 mg/m³) UK: P261, P273, P501

MEASUREMENT METHOD: D: HIGHLY #1500 1501 3000 4000 OSHA #513

VENTILATION: Ventilation equipment should be explosion resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Remove compliance with applicable requirements.

EYE PROTECTION: Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench shower at the construction work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirator and maximum air concentrations are listed from NIOSH and/or OSHA.

100 ppm

Air chemical cartridge respirator with organic vapor cartridge (oil)

Air powered, air purifying respirator with organic vapor cartridge (oil)

Air supplied-air respirator with a full facepiece and an organic vapor cartridge

Air supplied-air respirator

Air self-contained breathing apparatus with a full facepiece

Notes:

Air air purifying respirator with a full facepiece and an organic vapor cartridge

Air appropriate escape type self-contained breathing apparatus

For 150 ppm C concentrations or immediately dangerous to life or health

Air supplied air respirator with full facepiece and operated in a pressure demand or other positive pressure mode in concentrations with a separate escape supply

Air self-contained breathing apparatus with a full facepiece

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOR: colorless

ODOR: distinct odor

MOLECULAR WEIGHT: 82.14

MOLECULAR FORMULA: C₆H₁₀-C₁₀H₁₈

BOILING POINT: 223.1 (11) °C

FREEZING POINT: -26.1 (1) °C

VAPOR PRESSURE: 22 mmHg @ 20 °C

VAPOR DENSITY: Gas=0.814

SPECIFIC GRAVITY: (water=1) 0.690

WATER SOLUBILITY: 0.05% @ 20 °C

PH: Not available

VOLATILITY: 100%

ODOR THRESHOLD: 10-15 ppm

EVAPORATION RATE: 2-28 (ethyl acetate=1)

VISCOSITY: 0.560 cP @ 20 °C

COSOLVENT OF WATER/OIL: DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: alcohol, ether, benzene, chloroform, hexane, nitric acid, carbon disulfide, acetone

10. STABILITY AND REACTIVITY

ABSTRACT

CONDITIONS TO AVOID: A real heat, flames, sparks and other sources of ignition. Contaminant may rupture or explode if exposed to heat. Stay out of water stream and vapors.

THE COMBINATION EFFECTS. Indicators coordinated with ruthenium(II) acids coordinated ruthenium(II) metal salts

TABLE 1. *Continued*

ALLYL CHLORIDE + BENZYLCHLORIDE ALUMINUM OR ETHYLALUMINUM SESQUICHLORIDE

Downloaded At: 11:53 11 September 2009

UNCOMMON TRAILING EDGE ROCKS: Violent motion

1-800-690-55-DONUTS, 2-4 PM + 3-6 PM DAILY Free home service.

© 2007 The Authors
Journal compilation © 2007 Blackwell Publishing Ltd

MINERAL ACIDS (HYDROCHLORIC, SULFURIC, NITRIC) Increase risk

BETHEL A 158 8 1/2" x 11" x 1/2"

NETIC ACID + NITROUS ACID Tolerates decomposition, useful

POSTING: 2004-07-20 12:00:00.000. Commenter: Anonymous

CO-ORDINATING EDITOR: Peter and Barbara Howard

PLANTER NUMBER AND LOCATION Map by author

THE NEW YORK PUBLIC LIBRARY ASTOR LENOX TILDEN FOUNDATION 1215 6TH AVENUE NEW YORK, N.Y. 10020

SULFUR DICHLORIDE Various reactions, greatly accelerated in the presence of iron or ferric chloride:

NOTE: PLEASE PRINT **Northwestern University**

TECHNICAL SUPPORT techsupport@openoffice.org

COLANTINUM HEXAFLUORIDE Wetland marker

1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

Thermal decomposition products: oxides of carbon, hydrocarbons

POLYMERIZATION TO POLYMERIZATION

11. TOXICOLOGICAL INFORMATION

[illegible]

IRRIGATION DATA: 300 g/yr open-bottom, 630 mg stem-soluble salt, 300 mg stem-soluble residue to, 30 mg/24 hours (1) stem-soluble residue to, 870 mg open-soluble salt, 2 mg/24 hours (1) open-soluble, average, 300 mg/24 hours (1) stem-soluble salt, 300 mg/24 hours (1) stem-soluble salt

[illegible]

pregnant female continuous: 500 ppm, vehicle treatment: TCLO₂ 7 hours d-7 to 10 days of pregnant female continuous: 200 ppm, vehicle treatment: TCLO₂ 7 hours d-7 to 10 days of pregnant female continuous: 0 ppm, vehicle treatment: TCLO₂ 24 hours d-7 to 20 days of pregnant female continuous: 100 ppm, vehicle treatment: TCLO₂ 6 hours d-10 to 10 days of pregnant female continuous: 500 ppm, vehicle treatment: TCLO₂ 6 hours d-4 to -1 days of pregnant female continuous: 5000 ppm, vehicle treatment: TCLO₂ 4 days of pregnant female continuous: 5000 ppm, vehicle treatment: TCLO₂ 24 days of pregnant female continuous: 7700 mg/kg oral, vehicle: TCLO₂ 0-15 days of pregnant female continuous: 1500 ppm, vehicle treatment: TCLO₂ 7-20 days of pregnant female continuous: 2000 ppm, vehicle treatment: TCLO₂ 24 days continuous: 17500 ppm, vehicle treatment: TCLO₂ 0-20 days of pregnant female continuous: 1500 ppm, vehicle treatment: TCLO₂ 7-20 days of pregnant female continuous:

may usually be slow to produce signs of acute systemic toxicity

CHRONIC EXPOSURE

TOLUENE Prolonged or repeated contact with the liquid may cause softening of the skin with a dry formed desquama. Repeated application to skin it then produced dermatitis and severe irritation and skin necrosis. Topical application of 10 g daily produced an increase in plasma and lymphoid reticular cells in bone marrow of rats while 1 g daily had no effect.

ITE CONTACT

ACUTE EXPOSURE

TOLUENE Liquid may cause irritation and corneal burn if not promptly removed. Concentrations equal 200-500 ppm may cause retinal hemorrhages and hemorrhages. Corneal lesions and very fine necrosis have been reported in workers exposed to a solvent containing toluene. The lesions subsided following several days of non-exposure. Similar lesions have been produced in rats following exposure to toluene.

CHRONIC EXPOSURE

TOLUENE Repeated or prolonged contact with solids may cause corneal edema

INGESTION

ACUTE EXPOSURE

TOLUENE Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause a burning sensation in the esophagus, abdominal organs, and hemorrhagic gastroenteritis. Systemic effects may occur as described in acute inhalation. The approximate LD₅₀ dose in humans is 35-50 ml.

CHRONIC EXPOSURE

TOLUENE No effects were reported in rats fed up to 300 mg/kg/day for 180 days. A low resistance to normal fatty acid oxidation produced significant cardiomyopathy and an increase in chest pain on offspring

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA

FISH TOXICITY 1100 ug/L, 96 hours (LC50) (Rainwater) (Coke-solvent-extraction) (Oncochelys borealis)

INVERTEBRATE TOXICITY 4000 ug/L, 48 hours (EC50) (Rainwater) (Waste flow) (Daphnia magna)

ALGAL TOXICITY 2400 ug/L, 96 hours (EC50) (Green) (Green algae) (Selenastrum capricornutum)

FATE AND TRANSPORT:

KOW 279-62.07 (log = 4.770) (estimated from water solubility)

KOC (2046-44) (log = 4.303) (estimated from water solubility)

HEXP'S LAW CONSTANT 3.3 E-3 (estimated)

RED CONCENTRATION 1510 ug/L, 96 hours (HCF) (Rainwater) (Waste flow) (Daphnia magna) 1.5 ug/L

AQUATIC PREDICIES 3-400000 hours (Hawes Model) 1 in deep 1 mg/l flow 3 mg/l wind

ENVIRONMENTAL SUMMARY (Relatively) no bio-persistence in the environment. Not expected to leach through soil and/or the sediment. Accumulates very little in the bodies of living organisms. Highly soluble from water

13. DISPOSAL CONSIDERATIONS

Complies in accordance with all applicable regulations. Subject to disposal regulations. U.S. EPA 40 CFR, 262 Hazardous Waste Manual et. al. 1000

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 173.11

PROPER SHIPPING NAME: Toluene

ID NUMBER: UN1204

HAZARD CLASS OR DIVISION: 3

PACKING GROUP: II

LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS

SHIPPING NAME: Toluene

DS NUMBER: UN1204

CLASS: 3

PACKING GROUPS/CLASS: GROUP II

LAND TRANSPORT ADD

PROPER SHIPPING NAME: Toluene

DS NUMBER: UN1204

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: II

LABELS: 3

LAND TRANSPORT RID

PROPER SHIPPING NAME: Toluene

DS NUMBER: UN1204

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: II

LABELS: 3

AIR TRANSPORT IATA

PROPER SHIPPING NAME: Toluene

DS/DG NUMBER: UN1204

CLASS OR DIVISION: 3

HAZARD LABELS: 3

PACKING GROUP: II

AIR TRANSPORT ICAO

PROPER SHIPPING NAME: Toluene

DS NUMBER: UN1204

CLASS OR DIVISION: 3

LABELS: 3

DS/PACKING GROUP: II

MARITIME TRANSPORT IMDG

PROPER SHIPPING NAME: Toluene

OSHWB008 UN1254
CLASS OR DIVISION 3
FACING GROUP 1

15. REGULATORY INFORMATION

U.S. REGULATIONS

CFR/CA SECTIONS 199.103 HAZARDOUS SUBSTANCES (40 CFR 261.6)
TOX UENE (E000 L05 R0)

SARA TITLE III SECTION 303 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303.30) Not regulated

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303.40) Not regulated

SARA TITLE III SARA SECTIONS 119.02 HAZARDOUS CATEGORIES (40 CFR 370.31)
ACUTE Yes
CHRONIC Yes
FIRE Yes
REACTIVE No
STEADY RELEASE No

SARA TITLE III SECTION 311 (40 CFR 371.6)
TOX UENE

OSHA PROTECTIVE SAFETY (30 CFR 100.110) Not regulated

STATE REGULATIONS

California Proposition 65

Known to the state of California to cause the following

TOX UENE

Developmental toxicity (Jan 01 1981)

CANADIAN REGULATIONS

WHISK CLASSIFICATION Not determined

EUROPEAN REGULATIONS

EC CLASSIFICATION (4000000)

F	Highly Flammable
Xn	Harmful
Xn	Irritant
	Reproductive Tox. Category 3

EC Classification may be inconsistent with independently researched data.

**HAZARD/HAZARD SYMBOL
EC HSD AND SAFETY PHRASES**

H 22	Highly flammable
H 28	Irritating to skin.
H 40/38	Harmful - danger of serious damage to health by prolonged exposure through inhalation.
H 43	Possible risk of harm to the unborn child
H 45	Harmful - may cause long term damage if swallowed
H 47	Vapors may cause drowsiness and dizziness
S 2	Keep out of the reach of children.
S 36/37	Wear suitable protective clothing and gloves
S 48	If swallowed, seek medical advice immediately and show this container or label
S 52	If swallowed, do not induce vomiting - seek medical advice immediately and show this container or label

GERMAN REGULATIONS

WATER HAZARD CLASSING (G)

STATE OF CLASSIFICATION: VwVwS

CLASSIFICATION UNDER HAZARD TO WATER: 2

NATIONAL INVENTORY STATUS

D.S. INVENTORY (TSCA): Listed as secondary

TSCA ERM EXPORT NOTIFICATION: Not listed

16. OTHER INFORMATION

MANUFACTURER OF CHARGE

11. TECHNOLOGICAL INFORMATION

© Copyright 1994 2007 MBS Information Systems, Inc. All rights reserved

1. MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSD INFORMATION SYSTEMS, INC.

1201 Woodchuck Road, Suite 200
Nashville, TN 37217-3229
1-615-399-2000

EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (LOCAL AREA ONLY)
1-703-927-3800 (INTERNATIONAL)

SUBSTANCE: ETHYL BENZENE

TRADE NAME(S) (S) (S)

PHENYLETHANE ETHYLBENZENE ETHYLENEBENZOL ALPHA-METHYLTOLUENE ER UN1175
CHEM 0300790 RTECS RA0700000

CHEMICAL FAMILY: hydrocarbon aromatic

CREATION DATE: Feb 02 1995
REVISION DATE: Mar 13 2007

2. COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT: ETHYL BENZENE

CAS NUMBER: 106-62-4
EC NUMBER (EINECS): 203-345-4
EC INDEX NUMBER: 603-023-00-4
PERCENTAGE: 100

3. HAZARDS IDENTIFICATION

HAZ. RATING: (SCALE 1-4) HEALTH=3 FUEL=3 REACTIVITY=0

EMERGENCY OVERVIEW:

COLO: colorless

PHYSICAL FORM: liquid

ODOR: faintest odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard (corrosive)
nervous system depression, suspected cancer hazard (an aromatic)

PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges may be generated by flow, agitation, etc.

POTENTIAL HEALTH EFFECTS:

IRRITATION:

SHORT TERM EXPOSURE: irritation (possibly severe), chest pain, difficulty breathing, headache, drowsiness
dizziness, loss of consciousness, coma

LONG TERM EXPOSURE: irritation, headache, drowsiness, neurological dysfunction, cancer

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation (possibly severe)

LONG TERM EXPOSURE irritant
IRIT CONTACT
SHORT TERM EXPOSURE irritation (possibly severe)
LONG TERM EXPOSURE irritation
INGESTION
SHORT TERM EXPOSURE nausea, vomiting, stomach pain, respiratory hazard
LONG TERM EXPOSURE no information on equivalent adverse effects

CARDIOGENIC STATE

OSHA/NIH

MTF No

ABC Yes

4. FIRST AID MEASURES

DECONTAMINATION If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

EYE CONTACT Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION Aspiration hazard! **DO NOT** induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

NOTE TO PHYSICIAN For inhalation, consider oxygen. For ingestion, consider gastric lavage and activated charcoal slurry.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD Severe fire hazard! Vapors form explosive mixtures. The vapors become flammable. Vapors or gases may ignite at distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA regular dry chemical, carbon dioxide, water, regular foam

Lump foam Use regular foam or flood with fine water spray

FIRE FIGHTING Move container from fire zone if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area, Cool containers with water from underneath, hose holder or monitor nozzle until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn.

Water use Immediately in case of cargo moved, from venting, safety device or any deterioration of tank due to fire. For tanks, rail car or tank truck, Disconnect within 100 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high pressure water stream. Cool containers with water spray until well after the fire is out. Apply water from a protected location at from a safe distance. A vast inhalation of material or combustion by products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT 50.2 (115 C) (CCI)
LOWER FLAMMABLE LIMIT: 0.2%
UPPER FLAMMABLE LIMIT: 5.7%
ATFIONITION #101 (422 C)
FLAMMABLEITY CLASS (OSHA) 3

6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE

Refuse vapors with water spray

SOIL RELEASE

Stop holding area with an absorbent, good or get for containment. Take for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE

Absorb with activated carbon. Remove trapped material with suction hose. Collect spilled material using mechanical equipment. Collect with absorbent into suitable container. Neutralize. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supply and sewers.

OCCUPATIONAL RELEASE

A seal leak, flammability and other sources of ignition. Stop leak if possible without personal risk. Refuse vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: (Take for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than reported to 90) (US EPA Section 304) If release occurs in the US and is reportable under CERCLA, Section 102, notify the National Response Center at (800) 424-9302 (USA) or (202) 686-5675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store in bottle in accordance with all regulatory requirements and standards. Protect from physical damage. Store in a well-ventilated building. Store with flammable liquid. Inspect the storage container. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible materials.

8. EXPOSURE CONTROLS: PERSONAL PROTECTION

EXPOSURE LIMITS:

ETHYL BENZENE

100 ppm (420 mg/m³) OSHA TWA
100 ppm (342 mg/m³) OSHA STEL (exceed by 34.28 mg/m³) (see 29 CFR)
100 ppm ACGIH TWA
100 ppm ACGIH STEL
100 ppm (420 mg/m³) NIOSH recommended TWA, 10 hours)
100 ppm (342 mg/m³) NIOSH recommended STEL
DEC MAK (benzene + ethylbenzene) (40 ppm)
440 mg/m³ (300 ppm) EL OEL TWA (skin) (NIOSH)
894 mg/m³ (300 ppm) SC OEL STEL (skin) (NIOSH)
100 ppm (442 mg/m³) DS WHO TWA (skin)
100 ppm (392 mg/m³) DS WHO STEL (skin)

VENTILATION: Ventilation systems should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respiratory and maximum use concentrations are taken from NIOSH and/or OSHA.

100 ppm

Any air-purifying full-face respirator equipped with organic vapor-cartridge(s)

Any air-purifying full-facepiece respirator (gas mask) with a charcoal-type (most preferred) or hard-mounted organic vapor-cartridge

Any powered, air-purifying respirator with organic vapor-cartridge(s)

Any supplied-air respirator

Any self-contained breathing apparatus with a full facepiece

Emergency air supplied into safe enclosure concentrations at IDLH conditions

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Group 1:

Any air-purifying full-facepiece respirator (gas mask) with a charcoal-type (most preferred) or hard-mounted organic vapor-cartridge

Any appropriate escape-type, self-contained breathing apparatus

2. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOR: colorless

ODOR: distinct odor

MOLECULAR WEIGHT: 136.17

MOLECULAR FORMULA: C₈H₈ (42-02-05)

BOILING POINT: 277.9 (136 °C)

FREEZING POINT: 102.4 (25 °C)

VAPOR PRESSURE: 7.1 mmHg @ 25 °C

VAPOR DENSITY (air=1): 3.7

SPECIFIC GRAVITY (water=1): 0.870

WATER SOLUBILITY: 0.03%

PH: Not available

VOLATILITY: 100%

ODOR THRESHOLD: 150 ppm

EVAPORATION RATE:

VISCOSITY: 0.64 cP @ 25 °C

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Stable alcohol ether borane trifluoride- carbon tetrachloride
Insoluble ammonia

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressures.

CONDITIONS TO AVOID: A real heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITY: Ethyl aceto borane involving materials combustible materials

ETHYL BENZENE

ACIDS (STRONG): Possible violent reaction.

AMMONIA: Possible violent reaction.

BASES (STRONG): Possible violent reaction.

OXIDIZERS (STRONG): Fire and explosion hazard

PLASTICS: May be affected

HAZARDOUS DECOMPOSITION

Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize

11. TOXICOLOGICAL INFORMATION

ETHYL BENZENE

IRRITATION DATA: 100 mg/24 hours (1) eye; skin irritant; mild; 300 mg spray; subcutaneous

TOXICITY DATA: 100 ppm/6 hours (1) inhalation-human; TCLo: 2500 mg/kg oral rat; LD50: 4000 ppm/6 hours (1) inhalation-rat; LCLo: 50 ppm/24 hours (1) inhalation-mouse; LCLo: 2624 mg/kg intraperitoneal-mouse; LD50: 17000 mg/kg skin; rat; rat; LD50: 10000 ppm; inhalation-grass; pig; LCLo: 2000 ppm/6 hours (1) inhalation-grass; pig; LCLo: 400 ppm/6 months (1) inhalation-mouse; TCLo: 2500 mg/kg oral-rat; LD50: 30000 mg/kg; 24 hours (1) inhalation-rat; LC50: 22500 mg/kg/24 hours (1) inhalation-mouse; LC50: 10000 ppm; inhalation-mouse; LCLo: 3000 ppm/30 months (1) inhalation-mouse; LCLo: 27700 mg/kg; inhalation-human; TCLo: 5700 mg/kg/24 hours (1) inhalation-human; TCLo: 4050 mg/kg; inhalation-human; TCLo: 4050 mg/kg; inhalation-human; TCLo: 10 ppm/6 hours (1) inhalation-human; TCLo: 1000 mg/kg; intraperitoneal-rat; TCLo: 740 ppm/6 hours (1) 24 days (1) intraperitoneal; inhalation-rat; TCLo: 782 ppm/6 hours (1) 4 weeks (1) intraperitoneal; inhalation-rat; TCLo: 375 ppm/6 hours (1) 67 days (1) intraperitoneal; inhalation-mouse; TCLo: 722 ppm/6 hours (1) 4 weeks (1) intraperitoneal; inhalation-mouse; TCLo: 120 mg/kg/24 hours (1) 30 weeks (1) intraperitoneal; inhalation-rat; TCLo: 120 mg/kg/24 weeks (1) continuous oral; rat; TCLo: 30 mg/kg/30 years (1) intraperitoneal; inhalation-human; TCLo: 250 ppm/6 hours (1) 5 days (1) intraperitoneal; inhalation-rat; TCLo: 1000 ppm/6 hours (1) 6 days (1) intraperitoneal; inhalation-rat; TCLo: 1000 mg/kg/2 weeks (1) intraperitoneal-rat; TCLo

CARCINOGEN STATUS: IARC: Strong Inadequate Evidence, A: oral; Sufficient Evidence: Group 2B: ACQ204 A3: Animal Carcinogen

Two year inhalation studies showed clear evidence of carcinogenic activity in male rats based on increased incidences of nasal tubule adenomas and testicular adenomas. There was some oral and skin carcinogenic activity in female rats as measured by nasal tubule adenomas and increased incidences of alveolar/hemangioendothelial in male rats and hepatocellular adenomas in female mice (NTP TR-560)

LOCAL EFFECTS

Irritant; inhalation, skin, eye

ACUTE TOXICITY LEVEL

Moderately Toxic: ingestion

Slightly Toxic inhalation, dermal absorption.

TARGET ORGAN: central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: history describes: liver dysfunction, respiratory dysfunction, skin disorders and allergies

TOXICOKINETIC DATA: 750 ppm inhalation- rat: TC Lo⁵⁰ hours/1 (2 years); intermediate, 750 ppm inhalation- mouse: TC Lo⁵⁰ hours/1 (2 year); intermediate, 25400 mg/kg inhalation- rat: TC Lo⁵⁰ weeks/1 intermediate, 10000 mg/kg inhalation- rat: TC Lo⁵⁰ weeks/1 intermediate, 40000 mg/kg inhalation- mouse: TC Lo⁵⁰ weeks/1 intermediate, 40000 mg/kg inhalation- mouse: TC Lo⁵⁰ weeks/1 intermediate, 750 ppm inhalation- rat: TC Lo⁵⁰ weeks/1 intermediate, 750 ppm inhalation- mouse: TC Lo⁵⁰ weeks/1 intermediate.

MUTAGENIC DATA: sister chromatid exchange: human lymphocytes 10 mmol/L, mutation in mammalian somatic cells: mouse lymphocytes 50 mg/L, chromosome test: human lymphocytes 25 mg/L, specific locus test- mouse: intraperitoneal 754 mmol/L.

REPRODUCTIVE EFFECTS DATA: 57 ppm inhalation- rat: TC Lo⁵⁰ hours/1 15 days/1 per pregnancy (male and female); 750 ppm inhalation- rat: TC Lo⁵⁰ hours/1 1-15 days/1 per pregnancy female continuous; 50 ppm inhalation- rat: TC Lo⁵⁰ hours/1 1-15 days/1 pregnant female continuous; 400 mg/kg inhalation- rat: TC Lo⁵⁰ hours/1 7-15 days/1 pregnant female continuous; 2400 mg/kg inhalation- rat: TC Lo⁵⁰ hours/1 7-15 days/1 pregnant female continuous; 50 ppm inhalation- rabbit: TC Lo⁵⁰ hours/1 1-15 days/1 pregnant female continuous; 1000 mg/kg inhalation- rabbit: TC Lo⁵⁰ hours/1 7-15 days/1 pregnant female continuous; 1 grade/3 inhalation- rabbit: TC Lo⁵⁰ hours/1 7-15 days/1 pregnant female continuous; 1000 ppm inhalation- rat: TC Lo⁵⁰ hours/1 pregnant females/15 days/1 continuous.

ADDITIONAL DATA: May cross the placenta

Ethyl benzene exposed to photo-oxidation in the presence of ozone and nitrogen dioxide as in the formation of smog yields products having considerable toxicity to the respiratory

HEALTH EFFECTS

IRRITATION

ACUTE EXPOSURE

ETHYL BENZENE: May cause severe irritation of the nose and throat. Color is considered an adequate warning property at levels below systemic toxicity. At higher concentrations cough, fatigue, dyspnea, vertigo or dizziness, nausea, sense of chest constriction, headache, nausea and coma may occur. Death is possible from respiratory center paralysis. Exposed animals exhibited similar symptoms, as well as tearing of the conjunctiva, edema and corneal abrasion, skin pruritus, and loss of righting reflex. Loss of consciousness was followed by death from respiratory paralysis. Pathological included edema and congestion of the liver and lungs, generalized neuronal hyperemia, epithelial necrosis of the nasal turricles, and hepatic cytolysis. Color and eye irritation are considered adequate warning properties at levels below systemic toxicity. Reproductive effects have been reported in animals.

CHRONIC EXPOSURE

ETHYL BENZENE: May cause irritation of the upper respiratory tract, fatigue, dyspnea, headache, irritability and functional nervous disorders. Chronic inhalation exposure in animals has caused upper respiratory inflammation, nervous system disorders, hydrothorax changes in the liver and kidneys including toxic hepatitis changes in blood cholinesterase activity (leukocytosis and reticulocytosis). Tubercular hepatopathology was observed in rodents and monkeys. Reproductive effects have been reported in animals: increased pre- and post-natal loss; 100 or 1500 ppm for 6 hours/day on days 1 to 15 of gestation had offspring with a significant increase in extra rib formation. A two year study in rats and mice produced no increase in the incidence of nasal tumors (nasopharyngeal) testicular or ovarian, nasal tumors adenoma, alveolar/bronchiolar and hepatocellular neoplasms.

SKIN CONTACT

ACUTE EXPOSURE

ETHYL BENZENE: Local or severe may depending on concentration and length of exposure, cause irritation, inflammation, and possibly 1st or 2nd degree burns. Ethyl benzene was absorbed at a rate of 25-30 mg/cm²/hour on the hand and tissues of human subjects and could possibly cause systemic toxicity in an inhalation. Contact with solvent due to the liquid caused erythema, edematous and vesiculation.

CHRONIC EXPOSURE

ETHYL BENZENE: Repeated or prolonged exposure may cause rash or dermatitis by defatting the skin.

A disadvantage is reduced overall surgery time, reducing and reducing variation in slight increases in efficiency and turnover.

Keywords: child sexual abuse; disclosure; social support

Abstract

ETHYL METHOXY Carcinogenic initiation at levels of 300 ppm, which usually provides some warning of impending overexposure. Irritation and lacrimation may occur above 1000 ppm, with tolerance developing quickly and may be severe above 2000 ppm. At 3000 ppm, irritation is intolerable. 2 drops of the liquid on the eye of a rabbit caused slight conjunctival irritation and slight corneal opacity (gray) after 4 days; eye irritation after 7 minutes at 1000 ppm; and after 1 minute at 2000 ppm, with corneal edema. Serious irritation of the mucous membranes at 2000-3000 ppm.

© 2006 Blackwell Publishing Ltd *Journal of Internal Medicine* 260: 101–108

ETHYL BENZENE: Repeated or prolonged exposure may cause conjunctivitis. In one report workers exposed to 0.5-1.7 mg/m³ for more than another month complained of irritated eyes on day shift.

TRENDING

1. *Journal of the American Medical Association*, 2000; 284: 2689-2695.

EDUC. BENEFITS: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause abdominal pain, nausea, and vomiting which may lead to aspiration with airway obstruction and hemorrhage of fecal tissue. Aspiration by subcutaneous needles is likely to cause a small and asymptomatic abscess.

Abstract

FD471, 8/25/2006 Inquiries of 400-480 msg/typ/day for 102 days by wire caused slight increase and railway weight increases with slight acceleration.

13. ADDITIONAL INFORMATION

BEUTHE CITY BATH

© 2000 Blackwell Science Ltd, *Journal of Internal Medicine* 247: 399–406

DOI: 10.1002/for

[illegible]

13. DISPOSAL CONSIDERATIONS

Complies in accordance with all applicable regulations. Subject to disposal regulations. U.S. EPA 40 CFR, 262 Hazardous Waste Manual et. 2001

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 173.11

PROPER SHIPPING NAME: *Explanatory*

ID NUMBER: UN1170

HAZARD CLASS OR DIVISION: 3

PACING GROUP: B

LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS

SHIPPING NAME: *Explanatory*

ID NUMBER: UN1170

CLASS: 3

PACING GROUPS/PA. GROUP: B

LAND TRANSPORT ADG

PROPER SHIPPING NAME: *Explanatory*

ID NUMBER: UN1170

CLASS: 3

CLASSIFICATION CODE: F1

PACING GROUP: B

LABELS: 3

LAND TRANSPORT RID

PROPER SHIPPING NAME: *Explanatory*

ID NUMBER: UN1170

CLASS: 3

CLASSIFICATION CODE: F1

PACING GROUP: B

LABELS: 3

AIR TRANSPORT IATA

PROPER SHIPPING NAME: *Explanatory*

ID/ID NUMBER: UN1170

CLASS OR DIVISION: 3

HAZARD LABELS: 3

PACING GROUP: B

AIR TRANSPORT ICAO

PROPER SHIPPING NAME: *Explanatory*

ID NUMBER: UN1170

CLASS OR DIVISION: 3

LABELS: 3

DE PACING GROUP: B

MARITIME TRANSPORT IMDG

PROPER SHIPPING NAME: *Explanatory*

OSWALDER UNIT 75
CLASS OR DIVISION 3
FACING GROUP 1

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA SECTION 106(i)(3) HAZARDOUS SUBSTANCES (40 CFR 303.6) **CHTL DENZENE** 100 LBS SQ

SAFETY DATA SHEET SECTION 303 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303.60) **Not regulated**

SAFETY DATA SHEET SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303.60) **Not regulated**

SAFETY DATA SHEET SECTION 302 HAZARDOUS CATEGORIES (40 CFR 303.71)

ACUTE: **Yes**

CHRONIC: **Yes**

FIRE: **Yes**

REACTIVE: **No**

STUDY RELEASE: **No**

SAFETY DATA SHEET SECTION 311 (40 CFR 311.5)

CHTL DENZENE

OSHA PROTECTIVE SAFETY (30 CFR 100.116) **Not regulated**

STATE REGULATIONS

California Proposition 65

Known to the state of California to cause the following

CHTL DENZENE

Control (Jan 11 2004)

CANADIAN REGULATIONS

WHISK CLASSIFICATION: **Not determined**

EUROPEAN REGULATIONS

EC CLASSIFICATION (ANNEX VI)

F	Highly Flammable
Xn	Harmful

EC Classification may be inaccurate with only publicly available data.

DA THERMAL/HAZARD BY MODEL:

EC RISK AND SAFETY PHRASES:

R 11	Highly flammable
R 12	Hazardous by oxidation.
R 22	Lesser sort of the hazard of oxidation
R 24	Keep away from sources of ignition. No smoking
S 24/25	Avoid contact with skin and eyes
S 26	Do not empty into drains

CONCENTRATION LIMITS:

CL=CC% Va R 26

GERMAN REGULATIONS:

WATER HAZARD CLASSIFICATION:

STATE OF CLASSIFICATION: Very low

CLASSIFICATION UNDER HAZARDOUS TO WATER: I

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed as secondary

TSCA ERM REPORT NOTIFICATION: Not listed

15. OTHER INFORMATION

SUMMARY OF CHANGES

I. EXPOSURE CONTROL: PERSONAL PROTECTION

II. TOXICOLOGICAL INFORMATION

Copyrigt 1988 1987 M&E Information Systems, Inc. All rights reserved

1.9 MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MOEL INFORMATION SYSTEMS,
INC.

1201 Westborough Road, Suite 200
Nashville, TN 37217 7123
1 415 266-7000

EMERGENCY TELEPHONE
NUMBER

1 800-424-8399 (NORTH AMERICA)
1 703-927 3887 (INTERNATIONAL)

SUBSTANCE: XYLENES

TRADE NAME/SYNONYMS:
C660207

PRODUCT USE: analytical chemical/labatory chemical

CREATION DATE: May 15 1995

REVISION DATE: Mar 15 2007

2. COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT: M-XYLENE

CAS NUMBER: 106-36-3

EC NUMBER (EINECS): 203-276-3

PERCENTAGE: 40-45

COMPONENT: ETHYL BENZENE

CAS NUMBER: 106-66-6

EC NUMBER (EINECS): 203-243-4

PERCENTAGE: 15-25

COMPONENT: P-XYLENE

CAS NUMBER: 106-42-3

EC NUMBER (EINECS): 203-226-5

PERCENTAGE: <10

COMPONENT: O-XYLENE

CAS NUMBER: 95-47-6

EC NUMBER (EINECS): 203-402-3

PERCENTAGE: 10-20

3. HAZARDS IDENTIFICATION

NFPA RATING: SCALE 3-3- HEALTH=3 FLUE=3 REACTIVITY=3

EMERGENCY OVERVIEW:

COLOR: colorless

PHYSICAL FORM: liquid

ODOR: Pungent odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard central nervous system depression, suspect cancer hazard (in animals)

PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS:

IRRITATION:

SHORT TERM EXPOSURE: irritation, low body temperature. changes in body temperature, nausea, vomiting, stomach pain, chest pain, difficulty breathing, headache, dizziness, symptoms of cardiovascular distress, difficulty speaking, vocal cords become, loss of coordination, visual disturbances, lung congestion, kidney damage liver damage, unconsciousness coma.

LONG TERM EXPOSURE: irritation, nasal/anal, changes in body temperature, nausea, vomiting, stomach pain, loss of appetite, chest pain, difficulty breathing, irregular heartbeat, headache, dizziness, fatigue, depression, disorientation, sleep disturbances, emotional disturbances, vocal cords, long-term irritation, nausea, loss of coordination, visual disturbances, muscular weakness, steadily inflicting lung congestion, internal bleeding. blood circulation liver damage kidney damage, liver damage reproductive affects cardiovascular unconsciousness cancer

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation, blisters

LONG TERM EXPOSURE: irritation, rash

EYE CONTACT:

SHORT TERM EXPOSURE: irritation (possibly severe) sensitivity to light, tearing

LONG TERM EXPOSURE: irritation, blurred vision, eye damage

INGESTION:

SHORT TERM EXPOSURE: irritation, changes in body temperature, nausea, vomiting, digest or diarrhea, stomach pain, chest pain, difficulty breathing, headache, dizziness, symptoms of cardiovascular distress, difficulty speaking, vocal cords become, loss of coordination, visual disturbances, lung congestion, kidney damage, liver damage, unconsciousness coma, aspiration hazard.

LONG TERM EXPOSURE: reproductive effects

CARCINOGEN STATUS:

OSHA: 3b

NTP: No

IARC: Yes

4. FIRST AID MEASURES

IRRITATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: DO NOT induce vomiting. Never make an unconscious person stand or drink fluids. If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention.

5. FIRE FIGHTING MEASURES

FIRE AND EX PLOSION HAZARDS (Screen fire hazard. The vapors become flammable. Vapors or gases may ignite at distant ignition sources and flash back. Vapor-air mixtures are explosive above flash point. Containers may rupture as a result of exposure to heat.

EXTINGUISHING MEDIA regular dry chemical, carbon tetrachloride, water regular foam

Large fires Use regular foam or flood with fine water spray

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool container with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area, Cool container with water foam maintained. Move containers away from container until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising stored liquid vapors safety device or any deterioration of tanks due to fire. For tank, roll car on tank track. Evacuate radius 100 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not matter applied, material with high pressure water stream. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. A vast inhibition of material or combustion by products. Stay upwind and keep out of low areas.

FLASH POINT 111 F (27 C) (C)

LOWER FLAMMABLE LIMIT 1.1%

UPPER FLAMMABLE LIMIT 7.0%

AUTOIGNITION 107 F (40 C)

FLAMMABLEITY CLASS (OSHA) 2

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1984 (Proposition 65) Keep out of water supplies and sewers

OCCUPATIONAL RELEASE

Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: (Take for later disposal, Remove sources of ignition, Keep unnecessary people away isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to 100 LBS. (EPA Section 304) If release occurs in the US and is reportable under CERCLA Section 102, notify the National Response Center at 1-800-424-8802 (USA) or 1-800-424-2675 (USA)

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all relevant regulations and standards. Subject to storage regulations U.S. OSHA 29 CFR 1910.144: Grounding and bonding required. Store in a tightly closed container. Store in a well-ventilated area. Keep separated from incompatible materials.

8 EXPOSURE CONTROLS, PERSONAL PROTECTION

8.1 FUMES & LIMITS

M ETHYLENE

ETYLENE

100 ppm (420 mg/m³) OSHA TWA

100 ppm HSEI mg/m³ OSHA STEL (revised by SE PR 30200 June 30 1993)

100 ppm ACCOH TWA

100 ppm ACCOH STEL

100 ppm (420 mg/m³) NIOSH recommended TWA 10 (km/h)

100 ppm (420 mg/m³) NIOSH recommended STEL

440 mg/m³ (160 ul/m³) DPG MAE (peak limitation category - II, with a correction factor of 3) (extreme absorption danger)

321 mg/m³ (250 ppm) EC OEL TWA (skin) (OELV)

442 mg/m³ (160 ppm) EC OEL STEL (skin) (OELV)

50 ppm (220 mg/m³) DE WEL TWA (skin) (revised version)

100 ppm (441 mg/m³) UK WEL STEL (skin) (revised version)

MEDIA SEPARMENT METHOD D NIOSH TV #1501 3600 OSHA #1002

ETHYL BENZENE

100 ppm (420 mg/m³) OSHA TWA

100 ppm (445 mg/m³) OSHA STEL (revised by SE PR 30200 June 30 1993)

100 ppm ACCOH TWA

100 ppm ACCOH STEL

100 ppm (420 mg/m³) NIOSH recommended TWA 10 (km/h)

100 ppm (445 mg/m³) NIOSH recommended STEL

DPG MAE (extreme absorption danger)

442 mg/m³ (160 ppm) EC OEL TWA (skin) (OELV)

444 mg/m³ (200 ppm) EC OEL STEL (skin) (OELV)

100 ppm (441 mg/m³) UK WEL TWA (skin)

125 ppm (352 mg/m³) UK WEL STEL (skin)

MEDIA SEPARMENT METHOD D NIOSH TV #1501 OSHA 7 1002

P ETHYLENE

ETYLENE

100 ppm (420 mg/m³) OSHA TWA

100 ppm HSEI mg/m³ OSHA STEL (revised by SE PR 30200 June 30 1993)

100 ppm ACCOH TWA

100 ppm ACCOH STEL

100 ppm (420 mg/m³) NIOSH recommended TWA 10 (km/h)

100 ppm (420 mg/m³) NIOSH recommended STEL

440 mg/m³ (160 ul/m³) DPG MAE (peak limitation category - II, with a correction factor of 3) (extreme absorption danger)

321 mg/m³ (250 ppm) EC OEL TWA (skin) (OELV)

442 mg/m³ (160 ppm) EC OEL STEL (skin) (OELV)

50 ppm (220 mg/m³) DE WEL TWA (skin) (revised version)

100 ppm (441 mg/m³) UK WEL STEL (skin) (revised version)

MEDIA SEPARMENT METHOD D NIOSH TV #1501 3600 OSHA #1002

8 HYGIENE

HYGIENE

100 ppm (425 mg/dm³) OSHA TWA

150 ppm (637 mg/dm³) OSHA STEL (exposed by 50 FR 22207 Jan-26 1993)

150 ppm ACCGIH TWA

150 ppm ACCGIH STEL

150 ppm (425 mg/dm³) NIOSH recommended TWA 15 hours

150 ppm (637 mg/dm³) NIOSH recommended STEL

440 mg/dm³ (160 mg/m³) CPO MAE (peak limitation category "D" with maximum factor of 2) (extensive absorption/danger)

321 mg/dm³ (50 ppm) EC OEL TWA (class) (OELV)

442 mg/dm³ (160 ppm) EC OEL STEL (class) (OELV)

50 ppm (220 mg/dm³) UK OEL TWA (class) (normal exposure)

150 ppm (441 mg/dm³) UK OEL STEL (class) (normal exposure)

MEASUREMENT METHOD: PROSILV #1501 3000 OSHA #1002

VENTILATION: Provide local exhaust ventilation system. Ventilation system should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash-resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing. Remove any chemical soaked clothing immediately.

GLOVES: Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES: nitrile butadiene rubber (NBR).

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is needed in order to stay minimum to maximum. Consider warning properties before use.

Any chemical cartridge respirator with organic vapor cartridge(s).

Any chemical cartridge respirator with a full facepiece and any organic vapor cartridge(s).

Any air purifying respirator with a full facepiece and an organic vapor cartridge.

For Unknown Concentrations or Immediately Dangerous to Life or Health

Any supplied air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in coordination with a supply-air escape supply.

Any self-contained breathing apparatus with a full facepiece.

9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOR: colorless

ODOR: solvent odor

BOILING POINT: 229.5 F (109.7 C)

FREEZING POINT: 34.7 F (-40 C)

VAPOR PRESSURE: 3.1 mmHg @ 20 C

VAPOR DENSITY: Gas=10.3:0.8

SPECIFIC GRAVITY: (water=1): 0.87

WATER SOLUBILITY:

PH: Not available

VOLATILITY: 100%

ODOR THRESHOLD: Not available

EVAPORATION RATE: 0.51 (fragrance=1)

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressures.

CONDITIONS TO AVOID: A real heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supply and drains.

INCOMPATIBILITIES: oxidizing materials, acids, bases, combustible materials

XYLENES

OXIDIZERS (STRONG): May cause fire.

ETHYL BENZENE

ACIDS (STRONG): Possible violent reaction.

AMMONIA: Possible violent reaction.

BASES (STRONG): Possible violent reaction.

OXIDIZERS (STRONG): Fire and explosion hazard.

PLASTICS: May be attacked.

P XYLENE

ACETIC ACID + ADR: Possible explosion in liquid phase oxidation of p-xylene

1,3-DICHLORO-2,2-DIMETHYL, 2,4-DIMETHYLBENZENE: Possible explosion.

NITRIC ACID: Intense reaction.

OXIDIZERS (STRONG): Possible fire and explosion.

SULFURIC ACID: Intense reaction.

O XYLENE

OXIDIZERS (STRONG): Possible fire and explosion.

METYLENE

NITRIC ACID: Intense reaction.

OXIDIZERS (STRONG): Possible fire and explosion.

SULFURIC ACID: Intense reaction.

PARABENES DECOMPOSITION

Thermal decomposition products: oxides of carbon.

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

ETHYLENES

LOCAL EFFECTS

Irritant, ocul, irritant, skin, eye

TARGET ORGANS: central nervous system

HEALTH

IRITATION DATA 10 mg/24 hours/1 open skin rabbit-ovine 30 mg/24 hours/1 skin rabbit-male/rat 5 mg/24 hours/1 open rabbit-ovine 500 ppm/24 hours/1 skin-rat

TOXICITY DATA 424 mg/kg/4 hours/1-4 days/1 rabbit-rat-ovine/TCLo 400 mg/kg/24 hours/1 subcutaneous rabbit-rat-ovine/TCLo 800 ppm/4 hours/1 subcutaneous-rat/LCLo 300 ppm/24 hours/1 subcutaneous-rat/LCLo 2000 mg/kg intraperitoneal-rat-ovine/LD50 14100 ul/kg skin-rabbit/LD50 2 mg/kg intraperitoneal maternal LDLo 5 mg/kg subcutaneous-maternal LCLo 2287 ppm/6 hours/1 subcutaneous-rat/LC50 4380 mg/kg oral rat/LD50 100 ppm/6 hours/1 subcutaneous-rat/TCLo 300 ppm/subcutaneous-maternal/TCLo 4-12 ul/kg skin-rat/TCLo 1280 ul/kg/1 hours/1 skin-rat/TCLo 300 ul/kg/1 hours/1 intraperitoneal-pig/TCLo 50 ppm/2 hours/1 subcutaneous-human/TCLo 10 mg/kg/4 weeks/1 intraperitoneal oral rat/TCLo 400 ppm/6 hours/1 3 weeks/1 intraperitoneal subcutaneous-rat/TCLo 300 ppm/6 hours/1 20 days/1 intraperitoneal subcutaneous-rat/TCLo 1000 ppm/6 hours/1-4 days/1 intraperitoneal subcutaneous-rat/TCLo 0.05 ul/kg/4 days/1 intraperitoneal-rat/TCLo

CARCINOGEN STATUS IARC: Human Inadequate Evidence, Animal Inadequate Evidence Group 3 A/CGR: A4 -Not C Considerable as a Human Carcinogen

LOCAL EFFECTS

Irritant, sublethal, skin, eye

ACUTE TOXICITY & LEVEL

Mortality Time: rapidity

Slightly Toxic: sublethal, dermal absorption

TARGET ORGANS central nervous system

MUTAGENIC DATA DNA damage-human fibroblast 0-24 hr/0.01, 1 hours/1

REPRODUCTIVE EFFECTS DATA 3000 mg/kg subcutaneous-rat/TCLo/24 hours/1 7-14 days/1 pregnant female rats-ovine 12 mg/kg and ovine/TCLo 12-15 days/1 pregnant female rats-ovine 30 mg/kg oral ovine/TCLo 6-13 days/1 pregnant female rats-ovine 500 mg/kg subcutaneous-rat/TCLo/12 hours/1 6-13 days/1 pregnant female rats-ovine 300 mg/kg subcutaneous-rat/TCLo/24 hours/1 7-20 days/1 pregnant female rats-ovine

ADDITIONAL DATA Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation

FINAL REMARKS

IRITATION DATA 10 mg/24 hours/1 open skin-rabbit-rat 300 mg-rat subcutaneous

TOXICITY DATA 100 ppm/6 hours/1 subcutaneous-human/TCLo 3000 mg/kg oral rat/LD50 4000 ppm/6 hours/1 subcutaneous-rat/LCLo 50 gm/kg/24 hours/1 subcutaneous-ovine/LCLo 2024 ul/kg intraperitoneal-ovine/LD50 17000 ul/kg skin-rat/LD50 10000 ppm subcutaneous-pig/rat/LCLo 3000 ppm/6 hours/1 subcutaneous-pig/rat/LCLo 600 ppm/6 months/1 subcutaneous-ovine/TCLo 3000 mg/kg oral-rat/LD50 10000 mg/kg/24 hours/1 subcutaneous-rat/LD50 30000 mg/kg/24 hours/1 subcutaneous-ovine/LD50 10000 ppm subcutaneous-ovine/LCLo 8000 ppm/30 months/1 subcutaneous-ovine/LCLo 21700 mg/kg/24 hours/1 subcutaneous-human/TCLo 1700 mg/kg/24 hours/1 subcutaneous-human/TCLo 4380 mg/kg/24 hours/1 subcutaneous-human/TCLo 4380 mg/kg/24 hours/1 subcutaneous-human/TCLo 10 ppm/6 hours/1 subcutaneous-human/TCLo 1000 mg/kg intraperitoneal-rat/TCLo 740 ppm/6 hours/1-30 days/1 intraperitoneal subcutaneous-rat/TCLo 782 ppm/6 hours/1-4 weeks/1 intraperitoneal subcutaneous-ovine/TCLo 375 ppm/6 hours/1-20 days/1 intraperitoneal subcutaneous-rat/TCLo 782 ppm/6 hours/1-4 weeks/1 intraperitoneal subcutaneous-ovine/TCLo 190 mg/kg/24 hours/1-30 weeks/1 intraperitoneal subcutaneous-rat/TCLo 1280 mg/kg/24 weeks/1 continuous oral-rat/24 hours 30 mg/kg/27 years/1 intraperitoneal subcutaneous-human/TCLo 220 ppm/6 hours/1 3 days/1 intraperitoneal subcutaneous-rat/TCLo 1000 ppm/6 hours/1-8 days/1 intraperitoneal subcutaneous-rat/TCLo 1000 mg/kg/2 weeks/1 intraperitoneal oral-rat/TCLo

CARCINOGEN STATUS IARC: Human Inadequate Evidence, Animal Sufficient Evidence Group 2B A/CGR: A3: Animal Carcinogen

Two year sublethal studies showed clear evidence of carcinogenic activity in male rats based on increased incidences of nasal tubule neoplasms and tubular adenomas. There was some evidence of carcinogenic activity in female rats as indicated by nasal tubule adenomas and increased incidences of adenocarcinomas in male mice and hepatocellular neoplasms in female mice (NTP TR-46C)

LOCAL EFFECTS

Irritant, sublethal, skin, eye

ACUTE TOXICITY & LEVEL

Mortality Time: rapidity

Slightly Toxic: inhibition, dermal absorption.

TARGET ORGAN: central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: kidney disorders, liver disorders, respiratory disorders, skin disorders and allergies

TOXICOLOGIC DATA: 750 ppm inhalation-rat TCLo₅₀ (route) 2 year(s) intermittent; 750 ppm inhalation-mouse TCLo₅₀ (route) 2 year(s) intermittent; 25400 mg/kg inhalation-rat TCLo₅₀44 weeks(s) intermittent; 10000 mg/kg inhalation-rat TCLo₅₀44 weeks(s) intermittent; 40000 mg/kg inhalation-mouse TCLo₅₀100 weeks(s) intermittent; 40000 mg/kg inhalation-mouse TCLo₅₀100 weeks(s) intermittent; 750 ppm inhalation-rat TCLo₅₀ weeks(s) intermittent; 750 ppm inhalation-mouse TCLo₅₀ weeks(s) intermittent.

MUTAGENIC DATA: sister chromatid exchange: human lymphocyte 10 count/L; mutation in mammalian somatic cells: mouse lymphocyte 50 mg/L; chromosome test: human lymphocyte 25 mg/L; specific locus test-mouse: intraperitoneal 754 count/L.

REPRODUCTIVE EFFECTS DATA: 57 ppm inhalation-rat TCLo₅₀ (route) 18 day(s) pre-pregnancy continuous; 750 ppm inhalation-rat TCLo₅₀ (route) 1-15 day(s) pre-pregnant female continuous; 50 ppm inhalation-rat TCLo₅₀ (route) 1-15 day(s) pregnant female continuous; 400 mg/kg inhalation-rat TCLo₅₀ (route) 7-15 day(s) pre-pregnant female continuous; 2400 mg/kg inhalation-rat TCLo₅₀44 weeks(s) 7-15 day(s) pre-pregnant female continuous; 2400 mg/kg inhalation-rat TCLo₅₀44 weeks(s) 7-15 day(s) pregnant female continuous; 50 ppm inhalation-sublet TCLo₅₀ (route) 1-15 day(s) pre-pregnant female continuous; 700 mg/kg inhalation-sublet TCLo₅₀44 weeks(s) 7-15 day(s) pre-pregnant female continuous; 1 g/kg inhalation-sublet TCLo₅₀44 weeks(s) 7-15 day(s) pregnant female continuous; 1000 ppm inhalation-rat TCLo₅₀6 hours(s) pregnant female 0-20 day(s) continuous.

A ADDITIONAL DATA: May cross the placenta

2 day(s) because exposed to photo-oxidation in the presence of ozone and nitrogen dioxide, as in the formation of smog; yields products having considerable similarity to the human eye.

PELLETS

TOXICITY DATA: 4000 ppm/4 hours(s) inhalation-rat LC50; 3610 mg/kg intraperitoneal rat LD50; 15 g/kg inhalation-mouse LCLo; 2400 mg/kg intraperitoneal mouse LD50; >4000 ppm/4 hours(s) inhalation-guinea-pig LC₅₀; 2 g/kg intraperitoneal maternal LDLo; 3 g/kg inhalation-mouse maternal LDLo; 3010 mg/kg oral rat LD50; 400 ppm/7 week(s) intermittent inhalation-rat TCLo; 100 ppm/13 week(s) intermittent inhalation-rat TCLo; 1000 ppm/6 hours(s) 0-1 day(s) intermittent inhalation-rat TCLo; 1000 mg/kg/2 week(s) intermittent oral-rat TCLo.

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Inadequate Evidence - Group 3 - ACC2B; A4 - Not Classifiable as a Human Carcinogen

LOCAL EFFECTS

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL

Mediumly Toxic: inhalation, ingestion

TARGET ORGAN: central nervous system

REPRODUCTIVE EFFECTS DATA: 1000 mg/kg inhalation-rat TCLo₅₀44 hours(s) 0-10 day(s) pregnant female continuous; 150 mg/kg inhalation-rat TCLo₅₀44 hours(s) 7-14 day(s) pregnant female continuous; 5000 mg/kg inhalation-rat TCLo₅₀44 hours(s) 7-14 day(s) pregnant female continuous; 7 g/kg inhalation-rat TCLo 7-10 day(s) pregnant female continuous; 12 mg/kg oral mouse TDLo 15-15 day(s) pregnant female continuous; 500 mg/kg inhalation-mouse TCLo15 hours(s) 0-25 day(s) pregnant female continuous; 1 g/kg inhalation-sublet TCLo₅₀44 hours(s) 7-20 day(s) pregnant female continuous.

A ADDITIONAL DATA: Alcohol may enhance the toxic effects. Symptoms such as syncope may not be ventricular fibrillation.

DATA LINE

TOXICITY DATA: 3010 mg/kg oral rat LD50; 4120 ppm/5 hours(s) inhalation-human LCLo; 3 g/kg oral rat LDLo; 8120 ppm/70 hours(s) inhalation-mouse LCLo; 30 g/kg oral inhalation-mouse LDLo; 1500 mg/kg intraperitoneal mouse LD50; 1500 mg/kg intraperitoneal maternal LDLo; 2000 mg/kg inhalation-mouse maternal LDLo; 1000 ppm/6 maternal inhalation-mouse TCLo; 4000 ppm/6 hours(s) inhalation-mouse LC50; 3007 mg/kg oral rat LD50; 300 ppm/6 hours(s) inhalation-rat TCLo; 1000 ppm/13 week(s) intermittent inhalation-rat TCLo; 1000 ppm/6 hours(s) 0 week(s) intermittent inhalation-rat TCLo; 1000 ppm/6 hours(s) 0 day(s) intermittent inhalation-rat TCLo.

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Inadequate Evidence - Group 3 - ACC2B.

A4 - Not Classifiable as a Human Carcinogen

LOCAL EFFECTS

Liver: inhibition, atax, eye

ACUTE TOXICITY LEVEL

Mildness: Toxic- ingestion

Slightly Toxic- inhalation

TOXIC DOSE: 500 mg/kg - control nervous system

REPRODUCTIVE EFFECTS DATA: 150 mg/kg inhibition rat TCLoD4 hours (17-14 days) pregnant female continuous: 1500 mg/kg inhibition rat TCLoD4 hours (17-14 days) pregnant female continuous: 3000 mg/kg inhibition rat TCLoD4 hours (17-14 days) pregnant female continuous: 500 mg/kg (antepartum), rat TCLoD 2 days/ male: 500 mg/kg inhibition mouse TCLoD12 hours (14-19 days) pregnant female continuous

A SUBSTITUTED DATA: A lethal may indicate the toxic effects. Stimulants such as sympathomimetic may induce ventricular fibrillation.

HEALTH EFFECTS

INHALATION

ACUTE EXPOSURE

SYMPTOMS (J.T. Baker Inc. has reported the following): May cause irritation of upper respiratory tract, headache, nausea, vomiting, dizziness, inhibition of upper respiratory tract, nervous system, and may be fatal.

XYLENE Inhalation of the upper respiratory tract may occur at 200 ppm. Exposure to higher concentrations may cause more severe irritation and initial central nervous system stimulation followed by depression. Signs and symptoms may include respiratory difficulty and inhibition of pain, burning sensation and occasional lability headache, nausea, vomiting, ataxia, abdominal pain, dizziness, decreased vision, and staggering. There may be salivation, altered speech, blurred vision, mydriasis, lacrimation, convulsions, and flaking of the hair and a feeling of increased body heat. In severe exposures, there may be stupor, anesthesia, unconsciousness, and coma which may be punctuated by episodes of irritability. But rarely frank convulsions, except in terminal stages. Liver and kidney damage may occur but are usually mild and transient. A group of subjects who inhaled 15.2 mg/L of xylene in air continuously became significantly impaired on 2 neurophysiological tests. Exposure of 3 patients to approximately 10,000 ppm for 10-15 hours resulted in 1 death from pulmonary edema and petechial haemorrhage. Both survivors were unconscious for 12-24 hours and experienced retrograde amnesia, hyperreflexia, and lung congestion. Facial and hepatic enlargement also developed. Complete recovery took 20 days. High concentrations may cause death from asphyxia, ventricular fibrillation, but more frequently death occurs from respiratory arrest.

ETHYL BENZENE May cause severe irritation of the nose and throat. Color is correlated as adequate warning property at levels below systemic toxicity. At higher concentrations cough, lacrimation, depression, vertigo or dizziness, depression, sense of chest constriction, headache, nausea and coma may occur. Death is possible from respiratory center paralysis. Exposure animals exhibited similar symptoms, as well as because of the irritation, static and motor ataxia, rigidity, post, and loss of righting reflex. Loss of consciousness was followed by death from respiratory paralysis. Pathologists indicated edema and congestion of the brain and lungs, generalized visceral hyperemia, epithelial necrosis of the nasal turbinates, and hepatic dystrophy. Color and eye irritation are correlated as adequate warning properties at levels below systemic toxicity. Reproductive effects have been reported in animals.

CHRONIC EXPOSURE

SYMPTOMS (J.T. Baker Inc. has reported the following): No data available.

XYLENE Repeated or prolonged inhalation of vapors above 500 ppm may cause nausea, vomiting, abdominal pain and anorexia. Other common complaints include headache, fatigue, headache irritability, breathing difficulties, and dizziness. Effects on the nervous system may result in excitation, followed by depression, paroxysmal tremor, apnoeic, impaired memory, convulsions, vertigo and tremor. Effects on maximum heart normal coordination, body balance and EEG observed with repeated exposure to 10 ppm of m-xylene. (Wasson) tests in the mouth, dry nose and throat, strong throat, increased hemorrhage, and anemia have been reported. Effects on the liver, kidney, cardiovascular system, and the bone marrow have also been reported. Although the latter has

been questioned. Exposure of rabbits to 1000 ppm for 40-52 days resulted in a reversible decrease in the red and white cell counts and an increase in the platelets. One case of an apparent splenectomy occurred following a relatively brief exposure has occurred. Women may develop menstrual disorders such as menorrhagia or metrorrhagia, infertility, and pathological pregnancy conditions including toxicosis, delay in of menses and hemorrhaging during delivery. Reported responses of pregnant mice, rats and rabbits to the material on the animal system has resulted in maternal effects and effects on fertility on the embryo or fetus, and specific developmental abnormalities. Included among these effects are fetal death, intrauterine gas- and post-implantation mortality, abortion, resorptions and resorptions, and extra embryonic structures.

ETHYL BENZENE May cause irritation of the upper respiratory tract, fatigue, dizziness, headache, irritability and functional nervous disorders. Chronic inhalation-exposure to air which has caused upper respiratory inflammation, nervous system disorders, dyspnoic changes in the liver and kidneys including tissue hypertrophy changes in blood cholesterol activity, leukocytosis, and erythrocytosis. Testicular histopathology was observed in male rats and monkeys. Reproductive effects have been reported in animals. Human case: pregnant rats exposed to 100 or 1000 ppm for 6 hours/day on days 1 to 15 of gestation had offspring with a significant increase in extra rib formation. A two generation in rats and mice produced an increase in the incidence of renal tubule cysts, large testicular atrophy, renal tubule atrophy, alveolar/interstitial and hepatocellular neoplasms.

SKIN CONTACT

ACUTE EXPOSURE

XYLENE (J.T. Baker Inc. has reported the following) May cause irritation.

XYLENE Liquid xylene was a defoliant agent and may cause a burning sensation, drying, vesiculation, erythema, and possibly blistering. The liquid is readily absorbed through intact skin even at a rate of approximately 4-10 mg/kg/dose. Intensive effects have not been reported.

ETHYL BENZENE Liquid or vapor may depending on concentration and length of exposure, cause irritation, inflammation, and possibly 1st or 2nd degree burns. Ethyl benzene was absorbed at a rate of 20-30 mg/kg/dose on the hand and forearm of human subjects and could possibly cause systemic toxicity or an inhibition of contact with irritates due by the liquid caused erythema, redness and vesiculation.

CHRONIC EXPOSURE

XYLENE (J.T. Baker Inc. has reported the following) No data available.

XYLENE Repeated or prolonged contact may cause irritation of the skin with drowsy, erythema, cracking, blistering and blistering. Repeated application of 50% xylene to rabbits caused problems to normal irritation with erythema and moderate necrosis. One case of allergic contact dermatitis has been reported.

ETHYL BENZENE Repeated or prolonged exposure may cause such as irritation by defoliant the skin. Administration to rabbits caused effects ranging from edema and moderate irritation to slight necrosis, edema, and blistering.

EYE CONTACT

ACUTE EXPOSURE

XYLENE (J.T. Baker Inc. has reported the following) May cause irritation.

XYLENE 100 ppm has caused conjunctival irritation in humans at higher concentrations irritation may be severe. Vapor exposure has also caused burning and photophobia. An accidental splash in the human eye caused transient superficial damage with rapid recovery although irreversible corneal burns have also been reported.

ETHYL BENZENE Can cause irritation at levels of 200 ppm which usually produces some watering of conjunctiva. Concentration irritation and lacrimation may occur above 1000 ppm with tolerance developing quickly and may be severe above 2000 ppm. At 5000 ppm, irritation is intolerable. 2 drops of the liquid in the eye of a rabbit caused slight conjunctival irritation and slight corneal injury. Guinea pigs showed eye irritation after 8 minutes at 1000 ppm.

and after 1 month at 2000 ppm, with mortality, adverse mutation of the respiratory at 2000-30000 ppm.

CHRONIC EXPOSURE

XYLENE (J T Baker Inc. has reported the following) No data available

XYLENE Repeated or prolonged exposure to high vapor concentrations may cause a burning sensation, conjunctivitis and blurred vision, reversible muscular-skeletal numbness has been reported in some workers

ETHYL BENZENE Repeated or prolonged exposure may cause conjunctivitis. In one report workers exposed to 0.1-2 mg/L for more than 40 years, recorded complaints of red and watery eyes at day light.

INGESTION

ACUTE EXPOSURE

XYLENE (J T Baker Inc. has reported the following) May cause oral and other lesions, vomiting, diarrhea, gastrointestinal irritation, blurred vision, low blood pressure, and may be fatal.

XYLENE Lung damage may occur if inhaled into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause a burning sensation in the mouth and stomach, irritation, severe gastrointestinal distress with nausea and vomiting, possibly hemorrhage, and toxic effects including signs of central nervous system depression and other symptoms as in acute inhalation, including ventricular fibrillation and liver and kidney injury. Ingestion of small quantities of 99% xylene plus toluene produced urinary darkness and methemoglobin formation with toxic hepatitis, which was reversible in 30 days. A dose of 50-90 mL resulted (about 162 L water) in the myxoid human, lethal dose.

ETHYL BENZENE Lung damage may occur if inhaled into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause abdominal pain, nausea, and vomiting which may lead to ingestion with severe edema and hemorrhage of lung tissue. Aspiration by oral caused neurotoxic death by cardiac arrest and respiratory paralysis

CHRONIC EXPOSURE

XYLENE (J T Baker Inc. has reported the following) No data available

XYLENE Repetitive ingestion of the mixed, meta, or para isomers by pregnant mice resulted in effects on fertility on the embryo or fetus or specific developmental abnormalities. Included among these effects were fetotoxicity, reduced litter size, craniofacial and musculoskeletal system abnormalities and postnatal growth retardation

ETHYL BENZENE Ingestion of 400-480 mg/kg/day for 182 days by rats caused slight liver and kidney weight increases with slight pathological signs

13. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations

14. TRANSPORT INFORMATION

D.S. DOT UNDER 113 HAZ.
PROPER SHIPPING NAME: Xylene

ID NUMBER UN1307
HAZARD CLASS OR DIVISION 3
PACKING GROUP III
LABELING REQUIREMENTS 3

AIR/RAIL TRANSPORT DATA
PROPER SHIPPING NAME *Hydrazine*
UN NUMBER UN1307
CLASS 3
PACKING GROUP III

LAND TRANSPORT ADD
PROPER SHIPPING NAME *Hydrazine*
UN NUMBER UN1307
CLASS 3
CLASSIFICATION CODE F1
PACKING GROUP III
LABELS 3

LAND TRANSPORT RID
PROPER SHIPPING NAME *Hydrazine*
UN NUMBER UN1307
CLASS 3
CLASSIFICATION CODE F1
PACKING GROUP III
LABELS 3

AIR TRANSPORT DATA
PROPER SHIPPING NAME *Hydrazine*
UN NUMBER UN1307
CLASS OR DIVISION 3
HAZARD LABELS 3
PACKING GROUP III

AIR TRANSPORT SCAS
PROPER SHIPPING NAME *Hydrazine*
UN NUMBER UN1307
CLASS OR DIVISION 3
LABELS 3
OR PACKING GROUP III

MARITIME TRANSPORT IMDG
PROPER SHIPPING NAME *Hydrazine*
UN NUMBER UN1307
CLASS OR DIVISION 3
PACKING GROUP III

15. REGULATORY INFORMATION

15.1 REGULATIONS

CFR/CA SECTION 101/103 HAZARDOUS SUBSTANCES (49 CFR 101.13)
= *Hydrazine* 1000 LBS PG
CFR/1. REGULATION 1000 LBS PG

g kg/tonne 100 LBS BQ
+ kg/tonne 1000 LBS BQ

SARA TITLE III SECTION 303 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 303.30) Not regulated

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 304.30) Not regulated

SARA TITLE III SARA SECTION 311 (40 CFR 311.10)
ACUTE Yes
CHRONIC Yes
FIRE Yes
REACTIVE No
SOLID RELEASE No

SARA TITLE III SECTION 312 (40 CFR 312.10)
+ kg/tonne
ETHYL BENZENE
g kg/tonne
+ kg/tonne

OSHA PROCESS SAFETY (HCS) 1910.119 (Not regulated)

STATE REGULATIONS
California Proposition 65

Refers to the state of California to cause the following
ETHYL BENZENE
Canon (Jan 11, 2004)

CANADIAN REGULATIONS
WHMIS CLASSIFICATION: Not determined

EUROPEAN REGULATIONS
EC CLASSIFICATION/CLASULATED: Not determined

NATIONAL INVENTORY STATUS
US INVENTORY (FSCA): Listed as secondary

TECHNICAL EXPORT NOTIFICATION
F Y L E N E
CAS NUMBER 100-41-3
SECTION 4

19. OTHER INFORMATION

MSDS SUMMARY OF CHANGES
19 TOXICOLOGICAL INFORMATION

©Copyright 1994-2007 MCL Information Systems, Inc. All rights reserved.

ATTACHMENTS
STANDARD OPERATING PROCEDURES

BSI ESH&Q TRAINING

Battelle Science & Technology International ESH&Q Systems Management Program Plan

Title	BSTI ESH&Q Training Program
Number	ESHQ TRNG PP 000
Revision	0

Originator

John G. Evans
Training Coordinator, Quality Management Systems and
Training

Date

Reviewed By

Mark E. Jackson
Manager, Regulatory Compliance

Date

Approved By

Mathew P. Nair
Manager, Quality Management Systems and Training

Date

Agreed By

H. Joseph Garies
Vice President, Environment, Safety, Health, and Quality
Systems Management

Date

Consentance

Mary L. Duvall
Vice President, Operations and Systems Services

Date

TABLE OF CONTENTS

10	PURPOSE	3
20	SCOPE AND APPLICABILITY	3
30	PROGRAM REQUIREMENTS	3
31	a. Regulatory Standards	1
32	b. Regulatory Standards	1
33	c. Regulatory Standards	1
40	PROGRAM OBJECTIVES	3
50	PROGRAM DESCRIPTION	3
51	Overview	3
52	Key Functions and Services	3
60	ROLES AND RESPONSIBILITIES	4
61	Vice President, ESH&O / System Management	4
62	Manager, Quality Management Systems and Training	4
63	ESH&O Training Coordinator	4
64	ESTI Corporate and HCO Lab Operations, Inspection, and Project Managers	4
65	ESH&O Staff	4
66	Instructor	4
67	Student	3
70	INTERRELATION WITH OTHER PROGRAMS	5
71	HCO Training and Development	5
72	Safety and Health Management Program	5
73	Radiation Safety	5
74	HCO Waste Management Plan	5
75	Transportation Management Plan	6
76	VISION	6
80	METHODS FOR EVALUATING PROGRAM EFFECTIVENESS	6
81	QS-CP-007 "Customer Feedback"	6
82	QS-CP-008 "Customer Satisfaction Survey"	6
83	ESH&O New Staff Orientation	6
84	Food/Training Strategy	6
90	TRAINING	6
100	PROGRAM ASSESSMENT/CRITERIA	6
101	Internal/Independent Assessments	6
102	External Assessments	6
110	PROGRAM REVIEW	7
120	ASSOCIATED PROCEDURES	7

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	12/06/05	Initial release. Replaces BCC PP 03.

1.0 PURPOSE

This program defines the processes that the Environment, Safety, Health, and Quality (ESH&Q) Systems Management organization utilizes to support Battelle Science and Technology International (BSTI) management in training and qualifying personnel to safely carry out their assigned responsibilities.

2.0 SCOPE AND APPLICABILITY

This program defines the roles, responsibilities, and expectations for ESH&Q personnel involved in the training and qualification process and applies to all ESH&Q training and qualification activities for BSTI Corporate and Battelle/Columbus Operations (BCO) Lab Ops staff.

3.0 PROGRAM REQUIREMENTS

This program has been developed to comply with the following Battelle regulatory and/or voluntary standard requirements:

3.1 Battelle Standards

- Battelle Corporate Policy 1.6: "Environmental, Safety, and Health Program"
- Battelle Operating Guide Section 1390-5: "Safety and Health Training"
- SIH-PP-100: "Safety and Health Management Program"
- RS-MN-001, "Radiation Safety Manual"
- RS-PP-003: "Regional Office Radiation Safety Manual"
- EN-PP-001, "BCO Waste Management Plan"
- TRN-PP-001, "Transportation Management Plan"
- Battelle Safe Work Practices Handbook

3.2 Regulatory Standards

- Title 29: *Code of Federal Regulations: Occupational Safety and Health Administration*
- Title 40: *Code of Federal Regulations: Environmental Protection Agency*
- Title 49: *Code of Federal Regulations: Department of Transportation*

3.3 Voluntary Standards

- ISO 9001:2008: *Quality Management Systems Requirements*
- ISO 14001:2004: *Environmental Management Systems Requirements with Guidance for Use*

4.0 PROGRAM OBJECTIVES

The objectives of the ESH&Q training program are to:

- Describe the framework whereby BSTI Corporate and BCO Lab Ops staff, interns, subcontractors, and temporary personnel can obtain the necessary skill and knowledge to safely perform their assigned tasks.

- Define responsibilities for identification of training needs and methods for meeting these needs
- Identify who conducts and coordinates training in areas mandated by federal, state, and local regulatory agencies such as the Occupational Safety and Health Administration, the Environmental Protection Agency, and state departments of health.

3.0 PROGRAM DESCRIPTION

3.1 Overview

- 3.1.1 ESH&Q Training focuses on establishing BSTI wide standards, procedures, tools and guidelines that provide an integrated approach to training and qualification while allowing maximum flexibility to meet diverse organizational training and qualification needs.
- 3.1.2 ESH&Q Training utilizes a systematic approach to the analysis, design, development, implementation, and evaluation of training. This approach is based on methods for determining and implementing training that is directly related to the needs and requirements of the job. The formality and level of effort is determined primarily on the basis of complexity, consequences of improper task performance, and hazard potential or risk.
 - 3.1.2.1 The majority of ESH&Q training requirements result directly from regulatory requirements and drivers.
 - 3.1.2.1.1 The ESH&Q Training Department is closely aligned with the other ESH&Q departments, particularly Environmental Protection, Safety and Health/Emergency Response, Radiation Safety, and Quality.
 - 3.1.2.1.2 The ESH&Q staff in these departments work with BSTI, Corporate and BCO Lab Ops managers and supervisors to identify the hazards and risks associated with their various projects' scopes of work and to identify specific training required.
 - 3.1.2.2 Other training requirements are derived from project or customer specific needs. The ESH&Q Training Department relies upon managers and supervisors to take responsibility for identifying and meeting these training needs. The ESH&Q Training Department works with the managers and supervisors to implement training solutions to meet these needs.
- 3.1.3 The ESH&Q System Management organization has established the following minimum operation training requirements for new BSTI, Corporate and BCO Lab Ops staff:
 - 3.1.3.1 All newly hired staff, as well as interns, subcontractors, and temporary personnel, are required to take BCO 0013, "Environment, Safety, and Health," Parts I and 2.

5.1.3.2 Staff as well as interns, subcontractors, and temporary personnel assigned to work in a laboratory or around hazardous materials are also required to take BCO 0014, "Chemical Safety/Hazard Communication," BCO 0017, "Personal Protective Equipment," and BFW 0105, "Laboratory Waste Handling."

5.2 Key Functions and Services

- 5.2.1 Using a systematic approach, ESH&Q Training provides training needs analysis and design services as requested by customers.
- 5.2.2 Training development services provided by ESH&Q Training include applying systematic methods to the development of training programs and course training materials. Course training materials can be developed for a wide variety of media and settings, including classroom, self-study, reading assignments, computer-based training, Web-based training, on-the-job training, and seminars. In collaboration with subject matter experts (SMEs), ESH&Q Training can develop training for any technical subject or delivery method desired by the customer.
- 5.2.3 ESH&Q Training provides instructional services as a wide range of types, as requested and directed by customers. The Department has the capability to conduct ESH&Q and technical training using ESH&Q Department instructors. For other topics, ESH&Q Training can support requested training using internal adjunct staff, other internal SMEs, and external training vendors.
- 5.2.4 ESH&Q Training provides training evaluation and self-assessment services to ISTI Corporate and BCO Lab Ops managers and supervisors as requested.
- 5.2.5 Through its course catalog, scheduling, and registration services, ESH&Q Training provides a mechanism to inform staff about available ESH&Q-related training and a method to enable staff to register for training. Staff members are also notified of annual ESH&Q refresher requirements to enable them to remain current in their qualifications.
- 5.2.6 ESH&Q Training provides ISTI, Corporate and BCO Lab Ops managers, supervisors, and project managers with centralized administration of hard copy and computer database training records on completed staff training, meetings, and other training-related activities.
- ESH&Q Training also maintains original record copies of all approved training materials such as lesson plans, student handouts, and examinations.
- 5.2.7 ESH&Q Training provides a mechanism for identifying and documenting technical and instructional competencies needed to deliver effective training for instructors, including classroom trainers, on-the-job trainers, and training developers.

6.0 ROLES AND RESPONSIBILITIES

The following roles and responsibilities have been defined for implementing this program.

6.1 Vice President, ESH&Q Systems Management

Develops and promulgates ESH&Q policy and guidance with input from the BSTI management team.

6.2 Manager, Quality Management Systems and Training

6.2.1 Provides leadership and overall direction for maintaining the ESH&Q Training Program.

6.2.2 Manages the integration of VISION initiatives into the ESH&Q training function.

6.3 ESH&Q Training Coordinator

6.3.1 Provides direction and control for implementing and maintaining the ESH&Q Training Program.

6.3.2 Supports BSTI management with training and qualification activities for staff, interns, subcontractors, and temporary personnel to perform their assigned work.

6.3.3 Approves training materials and instructors for courses before training is offered and conducts post-training evaluations to ensure the quality of courses.

6.3.4 Organizes and schedules ESH&Q training and oversees the entry of all ESH&Q training information into the training records database.

6.4 BSTI Corporate and BCO Lab-Ops Managers, Supervisors, and Project Managers

6.4.1 Identify staff ESH&Q training needs and ensure staff are trained and qualified to safely carry out their assigned responsibilities.

6.4.2 Identify, implement, evaluate, and document project-specific training requirements based on regulatory and project specific requirements for job positions under their areas of responsibility.

6.5 ESH&Q Staff

6.5.1 Assist BSTI Corporate and BCO Lab-Ops managers and supervisors with identifying and implementing the training requirements that flow out of regulatory requirements and project- or customer specific needs. Maintain current knowledge of regulatory requirements, standards, and good practices affecting the work environment.

6.5.2 Conduct ESH&Q training sessions in their area of technical expertise as requested.

6.6 Instructor

6.6.1 Develops and/or conducts training in accordance with the BSTI ESH&Q Training Program.

6.6.2 Ensures that training documentation (e.g., attendance sheets, assessments) are completed, signed by the trainees, and submitted to ESH&Q Training for disposition.

- 4.6.3 Supports adherence to Battelle policies and standards for safe work practices.
- 4.6.4 Exhibits professional behavior in the classroom, laboratory and field.
- 4.6.5 Achieves and maintains instructional and technical qualifications.

5.7 Student

- 4.7.1 Arrives on time for training and remains for the entire session without interruptions or distractions including returning from breaks.
- 4.7.2 Exhibits professional behavior in the classroom, laboratory and field.
- 4.7.3 Participates actively and contributes in a positive manner.
- 4.7.4 Provides timely and constructive feedback on the effectiveness of the training and makes suggestions on additional training that might improve job performance.

3.6 INTERFACES WITH OTHER PROGRAMS

The ESH&Q Training Program interfaces with the following functions and programs within BSTI to facilitate comprehensive implementation of regulatory safety and health requirements.

7.1 BCO Training and Development

ESH&Q Training works with the Battelle Corporate Training and Development organization to leverage design and development resources across Battelle and from external sources in order to deliver effective and efficient training services.

7.2 Safety and Health Management Program

The process for identifying the potential occupational safety hazards associated with any BSTI project and the specific training or qualifications required for staff to safely complete their assigned tasks is outlined in ESH-PP-100 "Safety and Health Management Program."

7.3 Radiation Safety

- 7.3.1 Guidelines for determining the level of radiation safety training required for Battelle Columbus staff, based on the activity the staff member will be performing are contained in BS-MW-001 "Radiation Safety Manual."
- 7.3.2 Guidelines for determining the level of radiation safety training required for Regional Office BSTI staff, based on the activity the staff member will be performing are contained in BS-PP-003 "Regional Office Radiation Safety Manual."

7.4 BCO Waste Management Plan

The actions necessary to ensure that waste handling, packaging, transportation and disposal activities at Battelle are performed in accordance with applicable federal, state and local regulatory requirements are described in EN-PP-001 "BCO Waste Management Plan."

7.5 Transportation Management Plan

The requirement that all staff acting as BAZMAT employees have a documented training and that all materials are properly classified, packaged, and documented before being transported or offered for transportation is stated in TRN-PP-001, "Transportation Management Plan."

7.6 VISION

VISION is an integrated approach to improving environment, safety, health, and quality performance. Staff training needs may be identified through implementation of VISION activities.

8.0 METRICS FOR EVALUATING PROGRAM EFFECTIVENESS

An important element in the continuous improvement of training is the evaluation of training courses. Evaluations are conducted in a variety of ways.

8.1 QS-GP-007, "Customer Feedback"

QS-GP-007 "Customer Feedback" defines how to document, process, and resolve customer feedback received by ESH&Q Training in either verbal or written form.

8.2 QS-GP-008, "Customer Satisfaction Survey"

QS-GP-008 "Customer Satisfaction Survey" defines how customer satisfaction surveys are conducted regarding the services provided by the ESH&Q Systems Management organization.

8.3 ESH&Q New Staff Orientation

ESH&Q Training monitors the length of time from employee date of hire to completion of the required ESH&Q New Staff Orientation modules.

8.4 Post-Training Surveys

ESH&Q Training will conduct periodic post-training surveys of staff and their supervisors on the effectiveness of the training provided. Comments obtained through these surveys will be processed in accordance with QS-GP-004 "Corrective Action Procedure."

9.0 TRAINING

The process for training and qualification of ESH&Q instructional personnel and contract and social instructors is described in ESHQ TRNG-GP-001, "ESH&Q Instructor Training."

10.0 PROGRAM ASSESSMENTS/AUDITS

10.1 Internal Independent Assessments

Internal independent assessments will be conducted on a periodic basis to determine the efficiency and effectiveness of the overall ESTT ESH&Q Training Program.

10.2 External Assessments

External assessments may be conducted on a periodic basis by organizations separate from ESTT. These external assessments perform two key functions:

- Allow ESH&Q Training to learn how outside organizations view the training program

- Allow ESH&Q Training to compare its training program with other training programs for possible improvement initiatives.

11.0 PROGRAM REVIEW

This program shall be reviewed every 2 years.

12.0 ASSOCIATED PROCEDURES

The following documents are associated with this program.

- ESHQ TRNG- GP 001, "ESH&Q Instructor Training"
- ESHQ TRNG- GP 002, "ESH&Q Training A demonstration"
- ESHQ TRNG- GP 003, "Preparation and Revision of ESH&Q Training Materials"
- ESHQ TRNG- GP 004, "Identifying ESH&Q Training Requirements"

Battelle Science & Technology International Safety and Industrial Hygiene Program Plan

Title Chemical Safety Information Program

Number SITI-SP 004

Revision 3

Originator

Bernard Huzarolsch

Bernard Huzarolsch

Health and Safety Representative

12/12/06

Date

Reviewed By

Donald Cagle

Donald Cagle

Manager Safety and Health, and Emergency
Response

12/12/06

Date

Approved By

M. Joseph Gaskins

M. Joseph Gaskins

Vice President, BSI ESH&Q

12/21/06

Date

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	1
3.0	REGULATORY/VOLUNTARY STANDARD REFERENCES	1
4.0	RESPONSIBILITIES	1
4.1	PROJECT LINE MANAGEMENT	1
4.2	SAFETY AND HEALTH REPRESENTATIVE	1
5.0	PROCEDURE	2
5.1	MATERIAL SHEETS DATA SHEETS (MSDS)	
5.2	CONTAINER LABELING	
5.3	EXPOSURE MONITORING	
5.4	WILLARD EXPOSURE TEST AND EVALUATION	4
6.0	LABORATORY OPERATIONS	4
6.1	CONTROL MEASURES	4
6.2	HIGHLY HAZARDOUS MATERIALS	4
6.3	MSDS at CONSTRUCTION	4
7.0	NON-LABORATORY OPERATIONS	6
7.1	NON-LABORATORY AVAILABLE EXPERIMENTS	6
7.2	HAZARDOUS NON-RESEARCH TASKS	6
7.3	OUTSIDE CONTRACTOR PERSONNEL	7
8.0	TRAINING	8
8.1	GENERAL HAZCOM and Lab Standard Training	8
8.2	SPECIAL HAZCOM and Lab Standard Training Procedures	8
9.0	PROGRAM REVIEW	8
10.0	ASSOCIATED PROCEDURES	8
APPENDIX A COMPLIANCE CHECKLIST		10
APPENDIX B RECOMMENDED HANDLING PRACTICES FOR HIGHLY HAZARDOUS CHEMICALS		11

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	06/24/04	Original SOP-P-001
1	08/24/05	Updates document numbers and clarified information on labeling requirements.
2	10/24/06	Editorial changes, and changes for clarification and updating.

1.0 PURPOSE

The purpose of this program is to provide Battelle staff with information regarding Battelle Science and Technology International (BSTI) operations and methods of complying with the requirements of the Occupational Safety and Health Administration (OSHA) regulations, the "Hazard Communication" or "HAZCOM" (29 CFR 1910.1200) standard and the "Occupational Exposure to Hazardous Chemicals in Laboratories" or "Lab Standard" (29 CFR 1910.1450) standard. Both regulations require written programs. BSTI has addressed the requirements of both standards as they apply to Battelle operations in one written program: the Chemical Safety Information Program (CSIP). The CSIP is to be used both as a written Hazard Communication Program and a written Chemical Hygiene Plan for general BSTI operations. Specific operations may require job specific hazard communication.

The intent of both standards is to inform staff of:

- How to identify/determine the hazards of the chemicals with which they work
- The steps that can be taken to protect their health and safety
- Measures that they can take to protect themselves from chemical hazards
- The safety and health resources available to them and how they can obtain these resources

2.0 SCOPE AND APPLICABILITY

This program applies to all BSTI operations that use, handle, or store hazardous chemicals. This includes all laboratories and other locations, such as field operations, pilot plants, machine shops, construction shops and paint shops that use, handle, or store hazardous chemicals. This program does not apply to offices and other areas that do not use, handle, or store hazardous chemicals.

3.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- OSHA 29 CFR 1910.1200, "Hazard Communication"
- OSHA 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories"

4.0 RESPONSIBILITIES

4.1 Product Line Management

Product line management is responsible for implementing processes for compliance with the CSIP in their respective areas, especially to ensure that their staff are properly trained and informed. A CSIP Compliance Checklist is attached in Appendix A for guidance in implementing the CSIP.

4.2 Safety and Health Representatives

- 4.2.1 The Safety & Health representatives are responsible for assisting line management with the development and implementation of the Chemical Safety Information Program. They also function as the Chemical Hygiene Officers (CHOs) and/or Hazard Communication Coordinators.

- 4.2.2 Safety & Health representatives in conjunction with line managers are also responsible for ensuring that program effectiveness is evaluated annually and that changes are made based on the evaluation.

5.0 PROCEDURE

5.1 Material Safety Data Sheets (MSDSs)

- 5.1.1 MSDSs that are received for hazardous chemicals/materials are available from the MSDS coordinator, the Safety & Health representatives, and by accessing the TRIM system (<http://www.battelle.org/webtrimweb/>). In addition, the Occupational Health Services MSDS database is available to staff through the Battelle Technical Information Center (TIC) (<http://www.battelle.org/battelle/tic/resources/msds.msds>).

NOTE: Not all regional offices have access to the TIC database. Contact your Safety & Health representative for information on MSDSs.

- 5.1.2 The staff member purchasing a chemical is responsible for requesting an MSDS from the manufacturer of the item of purchase. For assistance, contact the appropriate Safety & Health representative or contact the MSDS coordinator.
- 5.1.3 If MSDSs are unavailable on new chemicals or new do not have an MSDS, staff should contact the chemical supplier or their respective Safety & Health representative.
- 5.1.4 If the HAZCOM standard applies, OSHA requires that an MSDS be available on-site for all hazardous chemicals used. Therefore, the staff member shall:
- 5.1.4.1 Manufacturer's contact their Manager/Supervisor or the Safety & Health representative, to obtain one.
 - 5.1.4.2 Not use the chemical until a MSDS can be located.
- 5.1.5 If the Lab Standard applies, the staff member shall notify the Safety & Health representatives so that he/she can ensure that precautions are identified, hazards are identified, and labels are appropriate.
- 5.1.6 MSDSs are received in a number of ways depending on the procedures of the supplier. If a staff member receives an MSDS directly from the supplier, he/she is responsible for sending a copy of the MSDS to the MSDS coordinator for the site. An additional copy should be sent to the BSLI Safety Health & Emergency Response (SHER) Office (Room 1219, King Annex.)
- 5.1.7 The BSLI SHER Office maintains a central file of MSDSs from the chemical suppliers for BSLI and will supply the most current MSDS available upon request.
- 5.1.8 Each non-laboratory area or section (including pilot plants) will maintain a central, accessible file of MSDSs for hazardous chemicals or substances used in its operation.

- 5.1.9 Each laboratory operation is encouraged to maintain a file of MSDSs for frequently used chemicals and hazardous chemicals.
- 5.1.10 Whenever a hazardous chemical is transferred (e.g., shipped) to another location, a MSDS must be included with the shipment or provided to the recipient before shipment. See Section 5.4.1.

5.2 Container Labeling

5.2.1 General Requirements

- 5.2.1.1 Original labels and inserts shall never be removed or defaced. Information on the label should include the name of the manufacturer or distributor, identity of the material, and hazard warnings.
- 5.2.1.2 When a chemical is dispensed from its original container into a secondary container, the secondary container must be labeled with at least the identity of the material.
- 5.2.1.3 Non laboratory operations (see Section 7.0 for definition) must include hazard warning(s) on the label for chemicals transferred from their original container (e.g., cylinders and reaction vortices).
- 5.2.1.4 When a hazardous chemical is transferred (e.g., shipped) to another location, the label must identify the manufacturer, supplier or responsible party, and must show any hazard warning(s) on the label. See Section 5.4.3.

5.2.2 Proprietary Container Marking

When contents of containers may not be identified due to proprietary or other reasons, the hazardous properties must be identified (e.g., corrosive, flammable, reactive nitrogen, etc.) and/or the container linked to a file record book by code or bar mark information as identified.

5.2.3 Waste Containers

All waste containers must be properly identified and labeled. Waste containers located at King Avenue and West Jefferson must be marked according to Environmental Procedures EN-GP-007, (Disposition of Chemical and Radioactive Waste and Spills). For other BSTI operations, contact your manager/supervisor for waste container labeling requirements.

5.3 Exposure Monitoring

- 5.3.1 When necessary, exposure monitoring will be conducted by SHER staff or other qualified designees to determine compliance with OSHA permissible exposure limits (PELs) or with other applicable standards or guidelines (e.g., American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs)).

- 5.3.2 Within 15 working days of the receipt of the results, employees will be notified of the exposure measuring results in writing.¹

5.4 Hazard Determinations and Evaluation

- 5.4.1 BSHI will rely on the chemical manufacturer's MSDS for hazard determinations and evaluations.
- 5.4.2 When a manufacturer's MSDS is not available, other reference sources will be used as necessary.
- 5.4.3 When BSHI provides a hazardous chemical or material to one of its clients as a product or ships a hazardous chemical or material off site, an MSDS must be provided with the initial shipment of the material and when new data becomes available to the client or user. In addition, the label must identify the manufacturer, distributor, importer or responsible party, and must show any hazard warning(s) on the label.
- 5.4.4 The author of the BSHI MSDS shall provide an electronic version of the MSDS and a copy of all supporting documentation used to create the MSDS to the appropriate Safety & Health representative for review and authorization. The representative will then transmit the finalized generated MSDS to the appropriate person for inclusion into BSHI's internally generated MSDS file.

6.0 LABORATORY OPERATIONS

This section outlines the requirements that apply only to laboratory-scale operations. "Laboratory scale operations" means work with substances in which containers used for reactions, transfers, and other handling of substances are designed to be easily manipulated by one person. This definition generally excludes pilot plant operations.

6.1 Control Measures

Laboratory operations are subject to review by Safety & Health representatives and designed to ensure that the design of the work, and of the equipment can prevent accidents that could expose workers to hazardous chemicals or conditions (e.g., pressure build up, temperature increases, etc.).

6.1.1 Engineering Controls

- 6.1.1.1 Hazardous chemicals, especially those that are volatile or are in gaseous state, generally must be used in a chemical fume hood.
- 6.1.1.2 Fume hoods must be maintained in proper working order. This is to be achieved in accordance with specific measures outlined in the Laboratory Hood Program, S01-GP-014.

¹Some chemical specific monitoring might not be required.

6.1.2 Personal Protective Equipment (PPE)²

PPE, such as safety glasses with side shields, goggles, face shields, gloves, and aprons are required whenever there is a risk of direct chemical contact, especially for those chemicals where skin and eye contact are prohibited. A Personal Protective Equipment Hazard Assessment Certification is to be completed by the line manager in conjunction with the Safety & Health representative in accordance with SH-PP-001, Personal Protective Equipment Program.

6.1.1 Respiratory Protection

Respirator use will be required whenever a hazardous chemical is used and cannot be exhausted through chemical fume hoods or other ventilation and if use conditions will expose the worker to potentially hazardous concentrations of chemicals. The use, selection, medical evaluations, and fit testing are coordinated by the Safety & Health representative and the Health Services Department. The Respiratory Protection Procedure, SH-GP-010 covers in more detail the requirements for respiratory use as directed by OSHA's 1910.134.

6.2 Highly Hazardous Materials

6.2.1 The use of compounds that are highly hazardous, such as select carcinogens, reproductive toxins, and acutely toxic substances, requires the prior review by the Safety & Health representative.

6.2.2 These substances must be handled according to specific operating procedures, which may include designated area decontamination procedures, specific waste handling procedures, and PPE.

6.2.3 Recommended handling procedures for specific categories of chemicals are included in Appendix B. Consult the Safety & Health representative for assistance in categorizing the chemicals to use.

6.3 Medical Consultation

Medical consultation and surveillance through Health Services (814-424-6337) is available to all laboratory employees, especially if:

6.3.1 A staff member develops signs or symptoms believed to be associated with exposure to the hazardous chemicals;

6.3.2 Air monitoring data indicate that exposures are above recommended levels (e.g., PEL, Action Level);

6.3.3 An incident such as a leak, spill, or explosion occurs that results in a potential exposure or overexposure.

²See Personal Protective Equipment Program: SH-PP-001

7.0 NON-LABORATORY OPERATIONS

NOTE: See Appendix A for "Compliance Checklist"

This section outlines the requirements that apply to non-laboratory areas. Non-laboratory areas include field operations, pilot plants, machine shops, construction shops, and print shops that use, handle, or store hazardous chemicals. This does not apply to offsite and other areas that do not use, handle, or store hazardous chemicals.

7.1 Non-Laboratory Area General Requirements

- 7.1.1 List the hazardous chemicals present in the work area. Each group or department is responsible for keeping a current list of hazardous chemicals used in non-laboratory areas.
- 7.1.2 The list must be checked against the available MSDSs on file. If any MSDSs are missing, contact the chemical supplier or the Safety & Health representative.
- 7.1.3 All such work areas as HSTI must designate a staff member and chemical is to be responsible for preparing and maintaining the list of chemicals.

7.2 Hazardous Non-Routine Tasks

- 7.2.1 Periodically, staff members are required to do hazardous non-routine tasks. Prior to working on such projects, supervisors are required to assure that each staff member is given appropriate on-site training as required in HSTI entry and health programs and as required by his/her supervisor or designer about any hazardous chemicals or processes to which they may be exposed while carrying out the non-routine task including:
 - 7.2.1.1 Information on the hazards of the chemical(s) to which they may be exposed.
 - 7.2.1.2 Protective equipment such as ventilation, respiratory protection, the presence of another staff member, written operating procedures, and emergency procedures that can be taken to prevent or reduce exposures.

- 7.3.2 Examples of hazardous non-routine tasks that might be performed by staff members include:

Task	Potential Hazards/Hazardous Chemicals
Confined Space Entry ¹	Oxygen deficiency; exposure to toxic materials, fire and explosion.
Work on New or Experimental Equipment ²	Stored energy; Electrical, mechanical, pneumatic.
Chemicals in Unlabeled Pipes (Leak, Flushing Operations)	Hazardous chemicals and gases carried in the pipe.

7.3 Outside Contractor Personnel

- 7.3.1 The Safety & Health representative for Facilities will be the primary contact for contractors performing facilities related work contracted through BNFL Facilities Support Operations.
- 7.3.2 Operations and research staff need the supervision of the areas where outside contractors work, share responsibility with the Safety & Health representative for Facilities to ensure that hazardous chemicals, potential hazards, and true safety precautions are identified and communicated to contractors.
- 7.3.3 Each Safety & Health representative is responsible for providing their respective outside contractors with the following:
- 7.3.3.1 Hazardous material information for the area.
 - 7.3.3.2 Precautions the contractor's personnel should take to lessen the possibility of exposure (e.g., the use of appropriate protective measures).
- 7.3.4 Outside contractors must adhere to the safety and health precautions specified in the Baticlec contract and listed in the Health and Safety Procedures and Practices for Contractors, information sheet (for a copy, contact the BNFL SH&ER office).
- 7.3.5 If a contractor is found to be in violation of any safety regulations, the Safety & Health representative should be notified immediately.

¹ See Confined Space Program, 104-10-000

² See Hazardous Energy Control Procedures, 104-10-000

8.0 TRAINING

8.1 General HAZCOM and Lab Standard Training

Training required by the Lab Standard for general topics is performed for all laboratory staff and other appropriate staff as part of the new staff orientation process. This training includes but is not limited to:

- § 1.1 Comparison and content of the provisions of both standards including when each may apply
- § 1.2 Labeling requirements in laboratory situations versus non-laboratory situations
- § 1.3 The location and availability of Material Safety Data Sheets (MSDSs)
- § 1.4 Methods and observations to detect the release of hazardous chemicals in the workplace
- § 1.5 Physical hazards and health hazards of commonly encountered chemicals in the workplace including signs and symptoms associated with chemical exposures
- § 1.6 Measures that may be taken to minimize and/or eliminate exposures to hazardous chemicals, such as the development of appropriate work practices, the use of personal protective equipment, and review of emergency procedures

8.2 Specific HAZCOM and Lab Standard Training Requirements

- § 2.1 Refer to section 7.0, New Laboratory Operations, for situations requiring specific training under the Hazard Communication standard
- § 2.2 Details of individual laboratory operations vary by laboratory activity, and process. Therefore specific work practices and chemical hazard information are to be transmitted to the staff by their supervisors with assistance from the Safety & Health representative, as necessary, prior to the start of work in which the employee may be exposed to chemical hazards

9.0 PROGRAM REVIEW

In order to comply with the requirements of 29 C.F.R. 1910.1450, Occupational exposure to Hazardous Chemicals in Laboratories, the effectiveness of the BSL Chemical Safety Information Program (BSI) equivalent to the chemical hygiene plan) must be reviewed and evaluated at least annually and updated as necessary (reference 29 C.F.R. 1910.1450(a)(4)).

10.0 ASSOCIATED PROCEDURES

- Personal Protective Equipment Program SII-PP-001
- Hazardous Energy Control Program Plan SII-PP-101
- Hazardous Energy Control Procedure SII-LP-004
- Confined Space Program SII-PP-08
- Refrigerators Protection Procedure SII-GP-006
- Laboratory Hood Program SII-CIP-014

- BCLD Operating Under 1340-1 Hazard Control- General
- Disposition of Chemical and Radioactive Waste and Spillout (EN-41P-007)

Appendix A: Compliance Checklist

Chemical Safety Information Program Compliance Checklist	
	Prepare a list of chemicals used in the work area. Laboratories should list the commonly used chemicals and before any new projects begin, add to the list as needed. Non-laboratory areas must list all chemicals or chemical products.
	Compare the chemical inventory list (non-laboratory areas only) against a list of the MSDSs in the work area to determine if any MSDSs are missing. If MSDSs are missing, immediately notify your supervisor, Safety & Health representative, or the chemical supplier to obtain a copy.
	Once the hazards of the chemicals are identified, specific safe work practices must be written.
	Staff must be trained and informed about the specific chemical hazards and written work practices before chemicals are handled and before any new chemicals or hazards are introduced into the work area.
	OSHHA's New Staff Orientation classes on the OSHA PPE Standard, Chemical Safety Information Program, Emergency Action Plan, and Health Services Orientation are presented via the Battlelle network. New Staff are notified electronically to inform them of the need to complete the Orientation. For more information, contact the training coordinator at 314-424-7149.
	Written procedures must detail how the institution will maintain a hazardous chemical inventory list, MSDSs, written work practices, and required staff training.

Appendix B: RECOMMENDED HANDLING PROCEDURES FOR HIGHLY HAZARDOUS CHEMICALS

1. Pre-nominate for additional engineering protection for work with the following categories of substances. Shall be made:

- Select Carcinogens
- Reproductive Toxins
- Acute Toxic Substances
- Reproductive Hazards

(Leading precautions for other types of "highly hazardous" chemicals, such as Chemical Safety Materials, explosives, biohazard materials, and radioactive materials, are provided in specific operating procedures at BGS/UC. For more information on these materials, contact the respective Safety & Health representative.)

2. Use small quantities: Do not buy, store, transfer, or use amounts greater than necessary for the immediate work.
3. Keep the containers closed to the extent possible to prevent or minimize the release of chemicals through vaporization, spillage, etc.
4. Open and transfer hazardous chemicals and conduct research work inside ventilated rooms (chemical fume hoods, glove boxes, etc.) whenever possible.
5. Post signs in the area where the work is being conducted (e.g., "Authorized Personnel Only").
6. Implement procedures for the highly hazardous waste disposal.
7. In many instances, protective clothing, from superficial gloves up to and including aprons and respirators, may be required especially if work is being conducted outside of the chemical fume hood. See the Safety & Health representative for evaluation of the work process for the appropriate personal protective equipment.

Battelle Science & Technology International Safety and Industrial Hygiene Program

Title Personal Protective Equipment Program

Number SSTI-PP-001

Revised 0

Originator: Stephen McHenry 7/23/04
Stephen McHenry Date

Safety and Health Representative

Approved By: Donald Cagle 7/27/04
Donald Cagle Date

Manager, Safety, Health & Emergency Response

Reviewed By: Carl Pittman 7/22/04
Carl Pittman Date

Manager, Quality Management Systems & Training

Approved By: Mark E. Jackson 7/22/04
Mark Jackson Date

Manager, Regulatory Compliance

Approved By: W. Joseph Garton 7/23/04
W. Joseph Garton Date

Vice President, SSTI SH&Q

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	1
3.0	PREREQUISITES	1
3.1	Training	1
4.0	DEFINITIONS	1
5.0	REGULATORY/VOLUNTARY STANDARD REFERENCES	1
6.0	RESPONSIBILITIES	1
6.1	Safety & Health Representatives	1
6.2	Managers	1
6.3	Project Managers	1
6.4	Employees	1
6.5	BSI ESH&Q Training	1
6.6	Contractors	1
7.0	PROCEDURE	1
7.1	General Requirements	1
7.2	Hazard Assessment and/or Line Managers and Safety Representatives Shall Evaluate	1
7.3	PPE Selection	2
7.4	Specialized Training	3
Appendix A: Guidelines for Conducting PPE Hazard Assessments		4
Appendix B: Categories of Personal Protective Equipment and Selection Considerations		5

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	06/11/04	Document re-issued under new numbering system. (Previous Number SIR PP 001)

1.0 PURPOSE

This program is intended to provide guidance for compliance with the requirements of the Occupational Safety and Health Administration (OSHA) Standard, "General Requirements, Personal Protective Equipment (PPE)" 29 Code of Federal Regulations (CFR) 1910.132 and subsequent PPE regulations in the section of the CFR.

2.0 SCOPE AND APPLICABILITY

This program applies to all Battelle Science & Technology International (BSTI) staff, including required officers and field operations, and to all contractors performing work on Battelle property or on behalf of Battelle. This program establishes minimum performance requirements. This program does not include hearing protection, respiratory protection, PPE used for fall protection or laser eye protection. These items are covered in other programs.

3.0 PREREQUISITES

3.1 Training

New employees working in labs shall be provided with basic PPE awareness training. This is typically included in the new employee safety orientation.

4.0 DEFINITIONS

Personal Protective Equipment (PPE) - clothing and equipment provided to employees to prevent contact from identified workplace hazards.

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- U.S. Department of Labor: OSHA Standard, "General Requirements, Personal Protective Equipment" 29 CFR 1910.132
- U.S. Department of Labor: OSHA Standard, "Eye and Face Protection" 29 CFR 1910.133 and American National Standards Institute (ANSI) Z87.1, Occupational and Educational Eye and Face Protection
- U.S. Department of Labor: OSHA Standard, "Head Protection" 29 CFR 1910.135 and ANSI Z89.1, Standard for Industrial Protective Helmets
- U.S. Department of Labor: OSHA Standard, "Foot Protection" 29 CFR 1910.136 and ANSI Z41.1, Personal Protection - Protective Footwear
- U.S. Department of Labor: OSHA Standard, "Hand Protection" 29 CFR 1910.138
- Battelle "Safe Work Practices Handbook" (Latest Revision)

6.0 RESPONSIBILITIES

6.1 Safety & Health Representatives

- 6.1.1 Assist managers, supervisors and project staff in conducting hazard assessments and identifying proper PPE.
- 6.1.2 Ensure employees receive training on the PPE they are expected to use.
- 6.1.3 Periodically review, update and evaluate the overall effectiveness of the PPE program.

6.2 Managers

- 6.2.1 Ensure hazard assessments are completed for physical areas and projects under their department section/area.
- 6.2.2 Ensure that all affected staff are properly trained and qualified to use, maintain and store the PPE they are expected to wear.
- 6.2.3 Ensure reasonable PPE is readily available.
- 6.2.4 Ensure defective or damaged equipment is immediately replaced.

6.3 Project Managers

- 6.3.1 Ensure hazard assessments are completed for assigned projects.
- 6.3.2 Ensure staff assigned to projects have PPE training based on the hazard assessments.

6.4 Employees

- 6.4.1 Wear PPE as required
- 6.4.2 Attend required training
- 6.4.3 Use, maintain and store PPE as required.

6.5 BSHS/SGHQ Training

Ensure new employee safety orientation training is provided on a regular, timely basis.

6.6 Contractors

- 6.6.1 Contractors shall receive a copy of this program. Any questions should be directed to the Battelle contact.
- 6.6.2 Contractors may be asked to provide a copy of their PPE program and/or hazard assessments supporting the work to be performed on Battelle premises or on behalf of Battelle.

7.0 PROCEDURE

7.1 General Requirements

PPE alone should not be relied on to provide protection against hazards, but should be used in conjunction with engineering controls, and administrative controls.

7.2 Hazard Assessment and/or Line Managers and SGHQ Representatives Shall Evaluate

- 7.2.1 Each work place or work activity where Battelle employees are exposed to hazardous conditions shall be evaluated to determine the need for PPE and what PPE is necessary.
- 7.2.2 The Safety and Health Representative in conjunction with the Manager/Supervisor or designee shall evaluate anticipated or actual work conditions, job categories, or activities to determine what PPE is necessary. See Appendix A for examples of hazard categories.
- 7.2.3 Hazard assessments shall be documented. Safe Work Plans and Standard Operating Procedures are examples of documents which may be used to document hazards and assessments. For organizations that do not have an internal method to document form SHE-PM-007 Personal Protective Equipment Hazard Assessment Certification may be used.

- 7.2.4 When work place conditions, physical locations, materials in use or activities change, Line Managers and S&H Representatives reassess the hazards and re-assess the suitability of the PPE. Update written documentation if necessary.

7.3 PPE Selection

- 7.3.1 Selection of PPE shall be based upon provision of a level of protection equal to or greater than the minimum required to protect from hazards identified in the hazard assessment.
- 7.3.2 The OSHA standards in the reference section include specific considerations based on the types of protection necessary (e.g. eye, hand, head). Each of these standards also incorporates, by reference, standards that identify requirements (typically equivalent standards developed by the American National Standards Institute) for PPE. When making PPE selections, familiarity with these references will ensure proper PPE selection. See Appendix B for selection guidance.

7.4 Specialized Training

- 7.4.1 Use of PPE that requires specialized training will be provided at the time the PPE is issued to or selected for affected employees.
- 7.4.2 Retraining shall be provided if an employee demonstrates deficiency in using or caring for PPE based on information provided in previous training.
- 7.4.3 Retraining also is required if there are significant changes in the workplace that render the previous training obsolete.

8.0 RECORDS

Name of Record	Record Media	Location
Hazard Assessments	Paper or electronic	Safety Groups
Training records	Paper	SSHS Q-Control Files

9.0 RELATED DOCUMENTS

- SSM FM 007 Personal Protective Equipment Hazard Assessment Form
- Battelle's "Safe Work Practices Handbook"

Appendix A: Guidelines for Conducting PPE Hazard Assessments

Conduct a walk-through survey of the area in question. The purpose of the survey is to identify sources of hazards to workers and co-workers.

Considerations should be given to the basic hazard categories:

- Impact
- Penetration
- Compression / roll over
- Chemical
- Heat
- Harmful dust
- Light (optical) radiation

During the walk-through observe:

- Sources of motion, i.e. machinery or processes where any movement of tools, machine elements or particles could exist, or movement of personnel that could result in collision with stationary objects
- Sources of high temperature that could result in burns, eye injury or ignition of protective equipment, etc.
- Types of chemical exposures.
- Sources of harmful dust.
- Sources of light radiation, i.e. welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.
- Sources of falling objects or potential for dropping objects.
- Sources of sharp objects which might pierce the feet or cut the hands.
- Sources of rolling or crushing objects which could crush the feet.
- Layout of workplace and location of co-workers.
- Electrical hazards.
- In addition, injury/accident data should be reviewed to help identify problem areas.

Appendix B. Categories of Personal Protective Equipment and Selection Considerations

Eye and face protection: The following chart provides general guidance for the proper selection of eye and face protection to protect against hazards associated with the listed hazard "source" operations.

Source	Assessment of Hazard	Protection
IMPACT Chipping, grinding, machining, assembly work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding	Flying fragments, objects, large chips, particles, sand, dirt, etc.	Spectacles with side protection, goggles, face shields. See notes (1), (10), (13), (14), (15). For severe exposure, use faceshield.
HEAT Furnace operations, pouring, casting, hot chipping, and welding	Hot sparks Splash from molten metals High temperature exposure	Faceshield(s), goggles, spectacles with side protection. For severe exposure use faceshield. See notes (11), (12), (13). Face shields worn over goggles. See notes (11), (12), (13). Screen face shields, reflective face shields. See notes (11), (12), (13).
CHEMICALS – acid and chemicals handling, degreasing, plating	Splash Irritating mists	Goggles, visors and cover hoods. For severe exposure, use face shield. See notes (11), (12). Special-purpose goggles.
DUST – sandblasting, buffing, general dusty conditions	Respirable dust	Goggles, visors and cover hoods. See note (11).
LIGHT and/or RADIATION – welding, electrical arc	Optical radiation	Welding helmets or welding shields. Typical shades 10-14. See notes (11), (12).
Welding Gas	Optical radiation	Welding goggles or welding face shield. Typical shades gas welding 4-8; cutting 3-8, brazing 3-4. See note (11).

Cutting, torch burning, torch and welding	Optical radiation	Spectacles or welding face shields. Typical shades 1, 5-8. See notes (39), (40)
Blows	Face visors	Spectacles with shield or special-purpose lenses, as available. See notes (51), (52)

Notes to Eye and Face Protection Selection Chart

- (1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.
- (2) Optics (e.g., grinding, heat, arc, torch, light, radiation, As required by the standard) protection from both hazards must be provided.
- (3) Face shields should only be used over primary eye protection (spectacles or goggles).
- (4) As required by the standard, filter lenses must meet the requirements for shade designation as D50, D53 or D5. Tinted and shaded lenses are not filter lenses when they are cracked or scratched or chipped.
- (5) As required by the standard, persons whose vision requires the use of prescription optical lenses must wear either protective devices lined with prescription (Rx) lenses or protective devices designed to be worn over any clear prescription (Rx) eyewear.
- (6) Persons of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dirty and/or chemical environments may represent an additional hazard to contact lens wearers.
- (7) Adequate conditions and the restricted ventilation of the protective room, when known to be required, may be necessary.
- (8) Welding helmets or face shields should be used only over primary eye protection (spectacles or goggles).
- (9) Non-vented shields are available for facial protection only. Not an adequate eye protection for the reasons and operations listed for "impact."
- (10) Ventilation should be adequate but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.
- (11) Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

Filter lenses for protection against radiant energy are listed below for various operations with the appropriate shade numbers.

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Arc A/C in	Acetylene Shade	Minimum Protection ¹
Shielded metal arc welding	Less than 3	Less than 10	7
	3-8	40-140	8
	8-11	140-200	10
	More than 11	200-300	11
Gas metal arc welding and flux cored arc welding		Less than 10	7
		40-140	10
		140-200	10
		200-300	10
Gas tungsten arc welding		Less than 20	8
		50-150	8
		150-200	10
Arc carbon arc cutting	Light	Less than 500	10
	Heavy	500-1000	11
Plasma arc welding		Less than 20	8
		20-140	8
		100-400	10
		400-600	11
Plasma arc cutting	Light ^{2,3}	Less than 200	8
	Medium ^{2,3}	200-400	8
	Heavy ^{2,3}	400-600	10
Thick burning		---	3
Thick cutting		---	2
Carbon arc welding		---	14

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Arc A/C in	Acetylene Shade	Minimum Protection ¹
Cut welding	Light	Under 1.8	4
	Medium	1.8 to 4.2	5
	Heavy	Over 4.2	6
Oxygen cutting	Light	Under 25	3
	Medium	25 to 150	4
	Heavy	Over 150	5

¹⁰ As a rule of thumb, start with a shade that is too dark to see the work area. Then go to a lighter shade which gives sufficient view of the work area without going a high yellow light, thus forcing us to use a filter lens that absorbs the yellow or yellow-green in the visible light of the spectrum of operation.

¹¹ These values apply when the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is defined by the work piece.

Head protection: All head protection (helmet) is designed to provide protection from impact and penetration hazards caused by falling objects. Head protection is also available which provides protection from electric shock and burn. When selecting head protection, knowledge of potential electrical hazards is important.

- Class A helmets in addition to impact and penetration resistance provide electrical protection from live voltage conductors (they are proof tested to 2500 volts)
- Class B helmets in addition to impact and penetration resistance, provide electrical protection from high-voltage conductors (they are proof tested to 10-500 volts)
- Class C helmets provide impact and penetration resistance (they are usually made of aluminum which conducts electricity) and should not be used around electrical hazards

When falling object hazards are present, helmets must be worn. Some examples include: working below other workers who are using tools and materials which could fall; working around or under conveyor belts which are carrying parts or materials; working below machinery or processes which might cause material or objects to fall; and working on exposed energized conductors. Some examples of occupations for which head protection should be routinely considered are: carpenters, electricians, linemen, mechanics and repairmen, glaziers and pipe fitters, assembler/packer, warehouse workers, oilfield laborers, freight handlers, trailer-coupling and logging stock handlers, and warehouse laborers.

Foot protection: Safety shoes and boots which meet the ANSI Z41-1991 Standard provide both impact and compression protection. If foot compression protection can be obtained which provides puncture protection, in some work situations, additional protection should be provided, and in other special situations electrical conductors or insulating safety shoes would be appropriate.

Safety shoes or boots with impact protection would be required for carrying or handling materials such as packages, objects, parts or heavy tools which could be dropped, and for other activities where objects might fall onto the feet. Safety shoes or boots with compression protection would be required for work activities involving steel tracks (metal or wooden handling carts), animal hoist rolls (such as paper rolls) and animal hoover pipes, all of which on fall potentially will over an employee's feet. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, broken concrete, large staples, sharp metal etc., could be stepped on by employees during a footstep.

Some occupations (e.g., complete lists for which foot protection should be routinely considered are: shipping and receiving clerks, stock clerks, carpenters, electricians, machinists, mechanics and repairmen, glaziers and pipe fitters, structural metal workers, assemblers, day-lab installers and laborers, packers, warehouse custom packers and shipping press operators, warehouse workers, laborers, freight handlers, gardeners and grounds keepers, trailer-coupling and logging workers, stock handlers and warehouse laborers.

Hand protection: Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure. CEHA is unaware of any gloves that provide protection against all potential hand hazards, and commonly available glove materials provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused.

It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated, e.g., chemical hazards, cut hazards, flame hazards, etc. These performance characteristics should be assessed by using standard test procedures. Before purchasing gloves, the employer should request information from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. Other factors to be considered for glove selection as general include:

(A) As long as the performance characteristics are acceptable, in certain circumstances, it may be more cost-effective to regularly change cheaper gloves than to wear more expensive types.

(B) The work activities of the employee should be studied to determine the degree of dexterity required, the duration, frequency, and degree of exposure of the hands, and the physical stresses that will be applied.

With respect to selection of gloves for protection against chemical hazards:

(A) The basic properties of the chemical(s) must be determined, in particular, the ability of the chemical to cause local effects on the skin *and/or* to pass through the skin and cause systemic effects.

(B) Generally, any "chemical resistant" glove can be used for dry protection.

(C) For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials.

(D) Employees must be able to remove the gloves in such a manner as to prevent skin contamination.

Other broad categories of gloves include:

- **Fabric** - Made of cotton or fabric blends; generally used to remove grime when handling slippery objects. Also help insulate from heat, heat or cold.
- **Leather** - Generally used to guard against abrasion from spalls or scrape against rough surfaces. Also used as reinforcement with an insulating liner when working with electricity.
- **Knit and mesh** - Used to protect from accidental cuts and scratches. Used when working with cutting tools or other sharp instruments.
- **Aluminized** - made of aluminized fabric and designed to insulate hands from intense heat.

Battelle Science & Technology International**Safety and Industrial Hygiene
General Procedure**

Title	Respiratory Protection Procedure
Number	SSTI-GP-010
Revision	0

Composed By


Debbie Knight

SSTI Safety Advisor

10-13-04
Date

Reviewed By


Curt Frennberg
SSTI, Manager, Quality Management
System and Training10/18/04
Date

Approved By


Donald W. Cagle
SSTI, Manager, Safety, Health and
Emergency Response10/15/04
Date

Approved By


Mark Jackson
SSTI, Manager, Regulatory Compliance10/13/04
Date

Approved By


N. Joseph Ginn
Vice President, SSTI Environmental, Safety,
Health, and Quality10/23/04
Date

TABLE OF CONTENTS

1.0	PURPOSE	1
1.0	SCOPE AND APPLICABILITY	1
1.0	PREREQUISITES	1
2.1	Training	1
2.2	Medical Evaluation	1
2.3	Fit Testing	2
4.0	DEFINITIONS	3
5.0	REGULATORY/CONSULTANT STANDARDS/REFERENCES	4
6.0	RESPONSIBILITIES	4
6.1	Line Management and Supervisors	4
6.2	Service Line Manager Responsibilities	4
6.3	Service Line Manager Authority	5
6.4	SCC Manager Responsibilities	5
6.5	Respiratory Unit	5
7.0	PROCEDURE	6
7.1	Hazard Controls	6
7.2	Hazard Assessments	6
7.3	Respiratory Selection	6
7.4	Manufacturer's Instructions and Controls/Requirements	6
7.5	Verification Log	6
7.6	Use of Respirators in Prohibited Areas With Breathing Device	6
7.7	Authorized Personnel, Restrictions	6
7.7.1	SCCA	6
7.7.2	Air-Line Operation	6
7.8	Authorized Personnel for Permit Controls Log	6
8.0	RECORDS	11
8.0	RELATED DOCUMENTS	11
APPENDIX A	RESPIRATOR CARTRIDGE SERVICE LIFE DETERMINATION	12
	Minimum and Maximum Allowable Cartridge Life and Warning Components Life	12
	Maximum and Minimum Recommended Cartridge Service Life	12
	Respirator Training History	12

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	11/24/2014	Replaced SCCA PP-000 - Review due to department Re-Organization

1.0 PURPOSE

The purpose of this procedure is to provide guidance for assessment of work areas, to establish personnel responsibilities, to assure proper selection, usage, and maintenance of respiratory protection equipment, and to establish a mechanism for the documentation of these activities in accordance with applicable regulatory requirements and accepted work practices.

2.0 SCOPE AND APPLICABILITY

This procedure applies to Battelle Science and Technology International (BSTI) including regional offices and field operations.

3.0 PREREQUISITES

3.1 Training

- 3.1.1 For the safe and effective use of respiratory protection equipment, it is essential that the user be properly instructed in its purpose, selection, use, and maintenance. Training must be provided by a qualified individual. Prior to being assigned a respirator, every respirator user must receive appropriate training in the following areas:
 - 3.1.2 Requirements of the respirator procedure, including responsibilities of associated personnel.
 - 3.1.3 Nature of the hazard(s).
 - 3.1.4 Exposure control methods.
 - 3.1.5 Suitability, capabilities, and limitations of the particular respirator to be used.
 - 3.1.6 Recognizing and handling emergencies as appropriate.
 - 3.1.7 How to don and doff respiratory protection equipment properly, including positive and negative pressure user seal checks.
 - 3.1.8 Requirements for inspection, storage, maintenance, and cleaning of the respirator.
 - 3.1.9 Respirator cartridge replacement frequency.
 - 3.1.10 The user must demonstrate competency by passing the given test with a score of 80% or greater.
 - 3.1.11 Refresher training will be given annually. Retraining also is required when a periodic inspection reveals inadequacies in the staff member's knowledge or use of the procedure.
 - 3.1.12 Authorization to use respiratory protection equipment will be revoked by the Safety and Health Representative or designee if refresher training is not satisfactorily completed.

3.2 Medical Evaluation

- 3.2.1 Medical approval is required for those who need to wear respiratory protection equipment. Staff will not be permitted to wear respirators in BSTI operations without a current medical statement approving such use.

3.2.2 A Medical Evaluator will determine an individual's physical fitness for respirator use. The intervals for examinations are established by BSI Health Services. Regardless of the frequency of examination, Health Services (or appropriate medical personnel) staff will evaluate staff files prior to annual refitting. Depending upon the medical condition of the individual, the Medical Evaluator shall determine the extent of medical testing necessary to approve continued respirator usage.

3.2.3 The Medical Evaluator will do one of the following:

- 3.2.3.1 Approve the individual for unrestricted use.
- 3.2.3.2 Approve the individual for restricted use and describe the restriction(s).
- 3.2.3.3 Deny use of a respirator to the individual.

3.3 Fit Testing

3.3.1 The following requirements must be met prior to a staff member being fitted for respiratory protection: (1) medical approval and (2) training completed.

3.3.2 Fit testing is performed by an authorized individual in accordance with the applicable approved quantitative or qualitative fit test protocol. This individual is appointed by the BSI Safety, Health and Emergency Response Manager.

3.3.3 Each different type of respiratory protection equipment that uses a facepiece to face seal shall be fit tested. This includes self-contained breathing apparatus (SCBA) masks, air line regulator masks, filtering facepiece (dust masks) and powered or nonpowered air purifying respirators (APRs). Positive pressure facepieces will be tested in the negative pressure mode.

3.3.4 For APRs, a sufficient number of styles and sizes will be made available. The staff member will be allowed to examine each of the respirators available and choose one for further fit test.

3.3.5 Fit testing will be performed at least annually for staff who remain active in the Respiratory Protection Procedure. Fit testing also will be repeated as necessary for staff that could affect the fit (e.g., excessive weight loss or gain, dentures, and scars).

4.0 DEFINITIONS

4.1 The following definitions apply only to this procedure:

Exposure Limit— Permissible exposure limit (PEL) as defined by the Occupational Safety and Health Administration (OSHA) as an employee's exposure to any substance listed in Tables Z-1, Z-2 and Z-3 in any 8 hour work shift of a 40 hour work week, which shall not exceed the 8-hour time-weighted average limit given for that substance in the table. Exposure limits also may be expressed in terms of ceiling concentrations. The American Conference of Governmental Industrial Hygienists establishes recommended exposure limits referred to as "threshold limit values." The National Institute for Occupational Safety and Health (NIOSH) also establishes "recommended exposure limits."

Immediately Dangerous to Life or Health (IDLH)— A n atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere. (Also see 29 Code of Federal Regulations (CFR) 1910.134(g)(34))

Oxygen Deficient Atmosphere— Oxygen deficient atmosphere means an atmosphere with oxygen content below 19.5% by volume.

Protection Factor (PF)— The number assigned to indicate the capability of a respirator to afford a certain degree of protection in terms of fit and filter/clearance penetrations. (Various agencies may assign PFs.)

Q suitable Fit Test - (QSFT) — A measurement of the adequacy of respirator fit by determining whether or not an individual using the respirator can detect the odor, taste, or irritation of a contaminant introduced into the vicinity of the user's head.

Q suitable Fit Test - (QSFT) — A measurement of the adequacy of respirator fit by numerically measuring concentrations of a challenge agent inside and outside the face piece. The ratio of the two measurements is an index of leakage at the seal between the respirator face piece and the user's face.

Respirator— Respiratory Protection Equipment— Any device certified by NIOSH and the Mine Safety and Health Administration that is designed to protect the user from inhalation of harmful contaminants. Disposable filtering facepiece and air-purified suits (bubble suits, not those that are incidentally pressurized when worn over an air supplying respirator) are specifically included even when used for non-toxic, non-irritant contaminants. Excluded are SCUBA and surgical masks. (Note: Surgical masks cannot be used as a substitute where respiratory protection is needed.)

4.2 The following definitions can be found in the BSI Glossary:

- | | |
|---------------------------|------------------------|
| • Administrative Controls | • Qualified Individual |
| • Authorized Technicians | • Qualified User |
| • Engineering Controls | |

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- 5.1 OSHA 29 CFR Section 1910.134 "Respiratory Protection."
- 5.2 Nuclear Regulatory Commission 10 CFR Part 20 "Standards for Protection against Radiation."
- 5.3 NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84
- 5.4 NIOSH Guide to Industrial Respiratory Protection.
- 5.5 The Occupational Environment—Its Evaluation, Control, and Management Chapter 36 American Industrial Hygiene Association
- 5.6 Compressed Gas Association G-8.1, "Commodity Specifications for Air"

6.0 RESPONSIBILITIES

6.1 Time Management and Supervision

- 6.1.1 Ensure that the applicable Safety and Health Representative is informed of any planned use or expected need for respirators or a change in process or conditions that may lead to a need for respiratory protection.
- 6.1.2 Ensure that staff under their supervision are qualified and trained prior to using respirators.
- 6.1.3 Implement and apply this procedure in accordance with the information received from the Safety and Health Representative.

6.2 Safety and Health Representatives

- 6.2.1 Maintain detail and current knowledge of regulatory standards requirements, equipment capabilities and good practice affecting safe and effective use of respirators.
- 6.2.2 Evaluate implementation and effectiveness of the procedure and make recommendations based on those evaluations.
- 6.2.3 Evaluate staff exposures and work conditions including making inspections of respiratory protection equipment use.
- 6.2.4 Specify and document the appropriate respiratory protection and associated equipment (e.g. cartridges, sorbents and canisters) based on anticipated work conditions or activities.
- 6.2.5 Ensure in conjunction with management that staff are properly trained and fitted with the proper equipment when required to use respiratory protection equipment.
- 6.2.6 Verify that breathing air requirements for supplied air respirators are in accordance to OSHA 29 CFR 1910.134 (i).
- 6.2.7 Evaluate anticipated work conditions or activities to determine what respiratory protection is necessary.

6.3 Safety and Health Advisor

- 6.3.1. A designated respirator fit testing
- 6.3.2. Inspect and maintain SCBAs located in general areas at King Avenue and West Jefferson sites.
- 6.3.3. Maintain respirator fit testing equipment and ample supply of respiratory protection equipment.
- 6.3.4. Generate documentation of maintenance and inspection records of respiratory protection equipment and respirator fit testing

6.4 BCO Health Services

- 6.4.1. Determine medical fitness for respirator use.
- 6.4.2. Utilize the OSHA approved medical questionnaire (29 CFR 1910.134 Appendix C) or equivalent form.
- 6.4.3. Provide medical evaluations to appropriate Line Managers and Safety and Health Representatives.

6.5 Respirator Users

- 6.5.1. Use, maintain, inspect, and store respiratory protection equipment as instructed to meet the procedure requirements.
- 6.5.2. Inform BCO Health Services of any personal health problems that could be aggravated by the use of respiratory protection equipment.
- 6.5.3. Inform BCO Health Services of any changes in health or physical characteristics (e.g., excessive weight changes, dentures, deformities resulting from accidents, pregnancy, etc.) that could affect the use of a respirator.
- 6.5.4. Notify Safety and Health Representative of any changes in respiratory usage, working environment, process, regulations, and laboratory protocols, etc., so that the use of the respirator may be re-evaluated.
- 6.5.5. Provide input to Safety and Health Representatives, management, or others involved in the implementation of this procedure as to its effectiveness and identify problems associated with the implementation.

7.0 PROCEDURE

7.1 Hazard Control

Line Management and Safety and Health Representatives shall work to develop engineering and/or administrative controls to reduce the need for respiratory protective equipment.

7.2 Hazard Assessment

- 7.2.1. Each work place or work activity where BSW employees are exposed to hazardous conditions shall be evaluated by the appropriate Safety and Health Representative to determine the need for respiratory protection.

7.2.2 Identification of hazards should include – but is not limited to – consideration of the following items:

7.2.2.1 Airborne contaminants present

7.2.2.2 Engineering or administrative controls in place

7.2.2.3 Other potential hazards (e.g. oxygen deficient atmosphere, confined space)

7.2.3 Hazard assessments shall be documented on Form SIH/PM 037 Personal Protective Equipment Hazard Assessment Certification.

7.3 Respirator Selection

7.3.1 The Safety and Health Representative or qualified designee shall become familiar with the types of respiratory protection available and their uses and limitations.

7.3.2 Respirators selected and used shall be NIOSH certified per 29 CFR 1910.134(d) (1) (a). Selection shall be based on a level of protection equal to or greater than the minimum required to protect the exposed employee(s) from the potential or observed hazards. Selection criteria that must be considered include the following:

7.3.2.1 Emergency situations

7.3.2.2 Presence of carcinogens

7.3.2.3 Contaminant concentration greater than the exposure limit

7.3.2.4 Contaminant concentration greater than the IDLH level

7.3.2.5 Oxygen deficient atmosphere <19.5% oxygen by volume (also IDLH)

7.3.2.6 Protection Factors

7.3.2.7 Adequate warning properties – taste, odor, irritation

7.3.2.8 Physical state of contaminant (gas/vapor or particulate)

7.3.2.9 Adverse health effects (in the event of breakthrough or leakage)

7.3.2.10 Amount of time respirator will be worn

7.3.2.11 Work activities/fitness (physical activity, temperature/humidity)

7.3.2.12 Fit test results (a different respirator must be selected if the one originally selected cannot be fit).

7.4 Maintenance, Inspection, and Care of Respirators

7.4.1 Any supplementary standard operating procedures, SOPs or protocols governing respirator use will include instructions for the maintenance and care of respirators. The SOP or protocol cannot be less restrictive than this procedure. Regular inspections shall be conducted by a qualified individual to assure respirators are properly used, cleaned, and stored. Items important to maintenance care, use and inspection include the following:

- 7.4.1.1 Inspection for defects (facepiece condition, headband, valves, and cartridges)
- 7.4.1.2 Cleaning, disinfecting, and decontaminating before and after use
- 7.4.1.3 Proper storage
- 7.4.1.4 Store to protect from damage, contamination that might alter the temperature, excessive moisture, and to prevent deformation of facepiece and exhalation valves.
- 7.4.2 Only an authorized individual, appointed by the BSH Safety Health and Emergency Response Manager, shall make repairs and replace parts, using parts designed for the respirator and authorized for use by the manufacturer. Users will make no repairs or modifications to any component, unless specifically instructed to do so by a qualified individual.
- 7.4.3 The user is responsible for maintaining a good facepiece seal in accordance with instructions received during training and fit testing. Respirators that depend on a facepiece seal will not be worn when conditions such as the following prevent an effective facepiece seal:
 - 7.4.3.1 Facial hair in the seal area
 - 7.4.3.2 Eyeglass temples extending through the seal area
 - 7.4.3.3 Shape of the face, facial features or scars, dentures or other conditions that would preclude an accurate measurement of respirator fit
 - 7.4.3.4 Protective clothing in the seal area.
- 7.4.4 The Supervisor, in conjunction with the Safety and Health Representative, is responsible for determining a respirator replacement schedule for respirator cartridges and shall perform periodic inspections to verify that cartridges are being replaced according to this schedule.
- 7.4.5 Information concerning respirator cartridge replacement can be found in Appendix A. The useful life of cartridges varies, under user conditions. Conditions of use include, but are not limited to: length of time the respirator is worn, ambient temperature, nature of use, humidity in area of use, and anticipated air volume based on the physical exertion of the user. Once this information is determined, the user shall be placed on a schedule to replace the cartridge at 80% of the maximum life expectancy for the selected cartridge. At a maximum, cartridges will be replaced:
 - 7.4.5.1 If the projected 80% maximum use limitation is exceeded
 - 7.4.5.2 If breakthrough is detected
 - 7.4.5.3 When the end-of-service life indicator shows the cartridge is expired or spent
 - 7.4.5.4 When instructed based on exposure potential
 - 7.4.5.5 When there is noticeably increased breathing resistance, or

7.4.5.6 If the cartridges have become damaged.

7.5 Voluntary Use

- 7.5.1 Voluntary use of an AFR is permissible if the individual's Safety and Health Representative approves the use in writing (Form SIH-FM-002, Voluntary Respirator Use). Voluntary use is not allowed for any other type of respiratory protection (i.e., supplied air respirators) nor is it allowed if the AFR, in itself, is determined to create a hazard.
- 7.5.2 Voluntary use is allowed only where the use is requested for comfort reasons by the employee from the Safety and Health Representative, who will determine the appropriateness of using an AFR. It will not be approved for exposure to toxic substances.
- 7.5.3 When approved, BSH will provide the appropriate NIOSH-approved AFR to be used. Employees will be informed that the AFR is to be used only for the purposes for which it was issued and that they are to discontinue use of the AFR if they experience any adverse health effects or difficulty breathing while wearing the AFR. If this occurs, they must report to BSH Health Services immediately.
- 7.5.4 The Safety and Health Representative will ensure that the employee requesting an AFR under the voluntary use provision has received a medical clearance to wear the respirator. (A medical clearance is not needed for a filtering respirator.) The Safety and Health Representative will ensure that the employee reads and understands the instructions provided by the manufacturer on use and limitations of the respirator and indicates such by signature on form SIH-FM-002.

7.6 Use of Respiratory Protection by Non-Battelle Staff

- 7.6.1 OSHA (29 CFR 1910.134) requires that respirator users have been (1) medically evaluated to determine medical fitness for respirator use, (2) properly trained in use, care, and limitations, and (3) properly fit tested.
- 7.6.2 Normally, non-Battelle staff are expected to bring their own respirators obtained through their employer's respirator program.
- 7.6.3 If a non-Battelle staff member requires a respirator, one can be issued upon verification of his/her physician's approval, training, and fit test status.

7.7 Atmospheric-Supplying Respirators

7.7.1 SCBAs

- 7.7.1.1 SCBAs are available in areas where a need for such equipment has been recognized. The SCBA units are maintained and ready for emergency use. In addition, SCBAs may be rented or purchased for specific projects. A Safety and Health Representative must approve the purchase and use of any breathing air systems to ensure that they meet the requirements set forth in OSHA's and Battelle's Respiratory Protection Procedures.
- 7.7.1.2 Only individuals specifically trained to use SCBA equipment may do so.
- 7.7.1.3 Inspection and maintenance of those located in ground areas at King Avenue and West Jefferson are the responsibility of a Safety and Health Advisor. Those purchased for specific projects are the responsibility of the divisions to which they belong. Regional offices and field operations are responsible for inspection of their own SCBAs.
- 7.7.1.4 At a minimum, SCBAs must be inspected monthly and after each use. Annually, they must be flow checked per manufacturer instructions by an authorized technician. Cylinders must be hydrostatically tested and regulators must be maintained per manufacturer instructions by an authorized technician.
- 7.7.1.5 SCBAs use a portable source of compressed air delivered through a high pressure hose from the cylinder to the respirator facepiece. Air supply for the cylinder is provided by an authorized vendor and must meet the requirements for Grade D or higher quality as set forth by Compressed Gas Association G 7.1, "Commodity Specification for Air." Documentation supporting this will be maintained.

7.7.2 Air-Line Respirators

- 7.7.2.1 Air-line respirators are available in areas where a need for such equipment has been recognized. The air-line respirator units are maintained and ready for emergency use. A Safety and Health Representative must approve the purchase and use of any breathing air systems to ensure that they meet the requirements set forth in OSHA's and Battelle's Respiratory Protection Procedures.
- 7.7.2.2 Only individuals specifically trained to use air-line respirators may do so.
- 7.7.2.3 Monthly inspections of those located in ground areas at King Avenue and West Jefferson are the responsibility of the air-line respirator user. Other inspections and maintenance required by manufacturer are required by the appropriate divisions. Regional offices and field operations are responsible for inspection of their own air-line respirators.

- 7.7.2.4 All air-line respirators must be inspected monthly and after each use. Annually, they must be flow checked per manufacturer instructions by an authorized technician. Cylinders must be hydrostatically tested and regulators must be maintained per manufacturer instructions by an authorized technician.
- 7.7.2.5 Air line respirators use a stationary source of compressed air delivered through a high pressure hose to the respirator facepiece. The air supply for air line respirators must meet the requirements for Grade D or higher quality as set forth by Compressed Gas Association G-7.1 "Commodity Specification for Air." Documentation supporting this will be maintained.
- 7.7.2.6 Breathing air compressors must be equipped with appropriate filtration and monitoring devices (e.g., carbon monoxide and temperature alarms).

7.8 Regional Offices and Field Operations

- 7.8.1 The Safety and Health Representative may delegate an authorized individual to conduct fit tests and manage other aspects of this procedure. The Safety and Health Representative will directly evaluate all off-site requests for performing fit tests and managing an off-site respiratory protection procedure. The Safety and Health Representative will verify and document the qualifications of an individual or individuals to conduct fit tests and to assume any other respiratory protection procedure responsibilities.
- 7.8.2 The Safety and Health Representative will inspect the procedure annually to ensure its effective functioning. The responsibilities of the regional offices and field operations Representatives will be reevaluated annually by the Safety and Health Representative. Their authority to conduct fit tests and/or manage the respiratory protection procedure may be revoked when deemed necessary by the responsible Safety and Health Representative.

10 RECORDS

Name of Records	Record Media	Location	Retention Period
Respiratory Protection Training	Paper	ESH&Q Control Files	Permanent
Medical Evaluation	Paper	BCO Health Services	Permanent
Respirator Fit Test (<1 year)	Paper or Electronic	Safety, Health, and Emergency Response	Permanent
Respirator Fit Test (> 1 year)	Paper or Electronic	ESH&Q Control Files	Permanent
Respirator Assessments	Paper or Electronic	Business Groups	Permanent
Agreement for AFR Voluntary Use	Paper or Electronic	ESH&Q Control Files	Permanent
ESH 139 SCBA Inspection and Cylinder Maintenance	Paper or Electronic	ESH&Q Control Files	Permanent
Air Supply for Atmosphere-Supplying Respirators	Paper or Electronic	ESH&Q Control Files	Permanent
Respirator Cartridge Replacement Schedule	Paper or Electronic	Business Groups	Permanent
SH FM 627 Personal Protective Equipment Record Assessment Certificates	Paper or Electronic	ESH&Q Control Files	Permanent
SH FM 602 Voluntary Respirator Use	Paper or Electronic	ESH&Q Control Files	Permanent

11 RELATED DOCUMENTS

- ESH Operating Guide 1340 2.1, "Respiratory Protective Equipment"

APPENDIX A Respirator Cartridge Service Life Determination

Organic vapor cartridge life expectancy will vary based on ambient relative humidity, flow rate through the cartridge, temperature, and concentration of the contaminant that is being removed from the air stream. The National Institute for Occupational Safety and Health (NIOSH) tests organic cartridges for air purifying respirators. The NIOSH test protocol requires that the organic cartridge be subjected to a flow rate of 94 liter per minute (lpm) at existing room temperature and relative humidity. The protocol also tests the cartridge at 30 lpm and 25% and 85% relative humidity. Through each of these tests, the organic cartridge is subjected to 1,000 parts per million (ppm) carbon tetrachloride and must withstand the concentration for 50 minutes with less than 5 ppm penetration. NIOSH does not test cartridges under varying conditions of use.

Methods for Determining Useful Cartridge Life for Varying Conditions of Use

This is a compilation of methods for determining the useful life of organic cartridge respirators. Select a method that is conservative, reproducible, and suitable for the needs of the workers. Use available manufacturer's information concerning service life for variable conditions.

Manufacturer's Suggested Respirator Change Schedule

Cartridge life extension is available through some manufacturer Web pages. Use the following Internet addresses to find information for some manufacturers:

- 3M — www.3m.com/quality — Then click on Establishing a Chemical Cartridge Change Schedule
- MSA — www.msa.com/usa/products/canisters/index.html
- Others — Check the Web page of your particular manufacturer.
- OSHA — http://www.osha-slc.gov/SLC/respiratory_adminmain06_modeltypes_anduses_model/for_cartridge_data_descriptions_datab.html or http://www.osha-slc.gov/SLC/respiratory_adminmainpage.html

Rule of Thumb Method

In Chapter 38 of the AHA publication *The Occupational Environment—An Introduction Control and Management*, a "rule of thumb" is presented for estimating organic vapor cartridge service life. The suggested rule of thumb is as follows:

- If the chemical's boiling point is > 70° C and the concentration is less than 200 ppm, the expected service life is 8 hours at a normal work rate.
- Service life is inversely proportional to work rate.
- Reducing concentrations by a factor of 10 will increase service life by a factor of 5.
- Humidity above 85% will reduce service life by 50%.

Battelle Science & Technology International**Safety and Industrial Hygiene
Program Plan**

Title Safety and Health Management Program

Number SH/PP-100

Revision 0

Originator



Donald Cagle

11/1/04

Date

Manager, Safety, Health, & Emergency Response

Reviewed By



Mark Jackson

11/4/04

Date

Manager, Regulatory Compliance

Reviewed By



Curt Plummer

11/5/04

Date

Manager, Quality Management Systems & Training

Approved By



N. Joseph Garcia

11/11/04

Date

Vice President, B&T ESH&Q Systems Management

Concurrence



Mary Davis

11/5/04

Date

Vice President, Operations & Systems Services

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE AND APPLICABILITY	1
3.0	PROGRAM REQUIREMENTS	1
4.0	PROGRAM OBJECTIVES	1
5.0	PROGRAM DESCRIPTION	3
5.1	Human Resources and Safety Education	3
5.2	Personal Development and Incentives	3
5.3	Documentation and Safety Work Practices	3
5.4	Contractor Review and Approval	3
6.0	ROLES AND RESPONSIBILITIES	3
6.1	Executive Vice President/CEO	3
6.2	General Manager/Divisional Leadership	3
6.3	Vice President - ESH/Operations & Strategic Services	3
6.4	Vice President - ESH/Operations Management	3
6.5	Loss and Incident Management	3
6.6	Safety Health and Environment Practices	3
6.7	Other	3
7.0	INTERACTIONS WITH OTHER PROGRAMS	6
8.0	METHODS FOR EVALUATING PROGRAM EFFECTIVENESS	7
9.0	TRAINING	7
10.0	PROGRAM ASSESSMENT/SAUDIT	7
11.0	PROGRAM REVIEW	7
12.0	ASSOCIATED PROCEDURES AND FORMS	8
APPENDIX A: SHH GUIDANCE FOR PROPOSAL WRITERS AND PROJECT MANAGERS		8
APPENDIX B: SHH SUBJECT MATTER EXPERT SAFETY REVIEW COMMITTEE		12

REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	11/15/04	Replaces SHH PP 001 - Formation of a Safety Steering Committee

1.0 PURPOSE

Battelle is committed to establishing and maintaining an accident, injury, and occupational illness-free environment. Battelle corporate policy 1.6 Environmental, Safety and Health Program states "It is Battelle policy to comply with the letter and spirit of all environmental safety and health (ES&H) laws and regulations." ALL staff must plan and conduct their work in a responsible manner to create and maintain a safe and healthy environment in Battelle Science & Technology International (BSTI) facilities and projects. The purpose of this program is to describe the operational framework and guidelines to address safety and health issues within BSTI.

2.0 SCOPE AND APPLICABILITY

This program is applicable to all BSTI staff and operations, including those involved in office laboratory, pilot plant and field work originating from King Avenue West/Jefferson and regional locations. The plan identifies related administrative and operating procedures, designates responsibilities and accountability, and describes work practices necessary to protect staff, facilities, and the public.

3.0 PROGRAM REQUIREMENTS

This program is written to describe how BSTI intends to comply with applicable regulatory and/or voluntary standard requirements:

- Occupational Safety and Health Administration (OSHA), General Industry and Construction Standards and references contained therein
- Ohio Public Building Code/Ohio Plm Code
- National Fire Protection Association (NFPA), applicable standards
- Battelle Operating Guide, Section 1.360 Environment, Safety and Health
- Battelle Corporate Policy 1.6 Environmental, Safety and Health Program
- Battelle Safe Work Practices Handbook

4.0 PROGRAM OBJECTIVES

The objectives of this program are to:

- Describe the overall management of Safety and Health (S&H) for BSTI.
- Define the key elements and processes of S&H employed by BSTI
- Define key roles and responsibilities for implementing S&H
- Provide the framework by which BSTI will comply with Battelle's Corporate Policy on ES&H

5.0 PROGRAM DESCRIPTION

The safety and health program provides a framework for hazard identification and evaluation, procedure development and documentation of safe work practices.

5.1 Hazard Identification and Evaluation

- 5.1.1 All proposed new projects within ESTI are cleared through the Integrated Risk Assessment Process.
 - 5.1.1.1 As a part of this process, project staff are asked to complete an Environment, Safety, Health and Quality (ESH&Q) Risk Assessment Questionnaire to identify any elements of the proposed project with safety considerations.
 - 5.1.1.2 The completed proposal, scope and questionnaire are reviewed by appropriate members of the ESTI Environment, Safety, Health and Quality Systems Management (ESH&Q SM) staff. Questions and concerns are brought directly to the attention of the project staff.
 - 5.1.1.3 To assist project staff in preparing the ESH&Q section of the Integrated Risk Assessment questionnaire during the proposal process, guidance is provided in Appendix A.
- 5.1.2 Upon project award or initiation, project staff assigned to the project are responsible for implementing appropriate safety controls and procedures. The assigned S&H representative works closely with project staff to ensure implementation of all safety requirements (sections 5.2 and 5.3).
- 5.1.3 Some projects require specialized knowledge and review to identify potential hazards. To address this, ESTI has several subject matter expert committees established to provide expertise and establish safety requirements in certain areas. See the section on Safety Review Committees (section 5.4) and Appendix P.

5.2 Program Development and Implementation

- 5.2.1 Safety and Health procedures within the Safety and Industrial Hygiene Manual are the primary documentation of S&H requirements.
- 5.2.2 ESTI ESH&Q SM will provide S&H subject matter expertise and support and will provide programs and program documentation at the ESTI level.
- 5.2.3 Each ESTI organization code will have a designated S&H Representative from within ESTI ESH&Q SM. The S&H Representative will perform with site staff to identify safety and health concerns for each site and assist in program implementation. The Sitefile abstract identifies the S&H Representatives.

5.3 Documentation of Safe Work Practices

- 5.3.1 Writing safe work practices, to identify safe work processes and procedures in the performance of projects, will be used to document and communicate instructions and information to staff. These may be in the form of Standard Operating Procedures, Safety Plans/Test Plans, Fact Sheets or similar documents. The tasks or station identified in the safe work practices will assist in

determining the training and qualification requirements. Appendix A provides a project planning and project operations phase list of items that should be considered to help determine if written safe work practices are needed for the project.

- 5.3.2 Project implementation may require documentation specific to the project or working group in addition to documents referenced in 5.2.2. Project staff and the SH Representative will work together to ensure proper requirements and procedures are documented.

5.4 Committee Review and Approval

- 5.4.1 BSH will establish safety committees to facilitate safety program implementation. There will be committees at the BSH level as well as committees embedded within product lines.
- 5.4.2 BSH will establish a Safety Steering Committee overseen by the Vice President ES&H QSM to establish and review goals and expectations for the BSH safety program. The Safety Steering Committee will also serve as a review committee for significant hazards not covered by other subject matter expert review committees.
- 5.4.3 The Safety Steering Committee will be made up of representatives from Safety and Health, Facilities, Health Services, Emergency Management, Research Management, Security, Human Resources and appropriate subject matter experts as necessary.
- 5.4.4 As a guideline, projects require review by the Safety Steering Committee when:
- A substantial potential exists for escape of, or contact with, toxic gases, vapors, particulates, or liquids resulting in an exposure or environmental release in violation of applicable regulations, established guidelines or rules of good practice.
 - A potential exists for substantial exposure to, or contact with, gases, vapors, particulates, or liquids whose toxic hazards have not been investigated or shown to be acceptable through burn-in experience.
 - Work involves unusually large quantities of a hazardous material, or when staff is inexperienced in handling hazardous materials of the proposed type or quantity.
 - A potential exists for use or formation of explosive substances, or when explosive materials or standard equipment and facilities designed for such purposes are used.
 - A potential exists—as is likely to be perceived—for members of the public to be exposed to a hazard other than routine traffic hazards arising from a fireable operation.
 - Operations of a type that require review as indicated above occur in a facility that is newly constructed or substantially altered.

- A potential costs for operations involving hazards associated with the following when conducted in areas not specifically or previously approved:
 - o High structures
 - o Confined spaces, e.g., sewers, tunnels, tanks, and pits
 - o Diving requiring decompression
 - o Unusual electrical hazards
 - o Workplaces over or in or near bodies of water
 - o Unusual work procedures
 - o Agressive or hostile environments, e.g., jungles and war zones
 - o Heat or cold exceeding work stress criteria
 - o High stored energy systems.

- 5.4.5 All the BEST1 level appropriate subject matter expert committees will be established to address a specific project safety concerns. Each of the subject matter expert committees will have a defined purpose and operational scope. A brief description of the current subject matter expert committees is provided in Appendix B.
- 5.4.6 Operational Safety Committee will be established within a product line. The current organizational structure will be used to establish where safety committees are appropriate. The assigned S&H Representative will assist line management in establishing the committee and serve as a subject matter expert to the committee.
- 5.4.7 The Operational Safety Committees are expected to:
- 5.4.7.1 Meet at least quarterly
 - 5.4.7.2 Be composed of a representative cross-section of staff in the product line or group for which the committee is established
 - 5.4.7.3 Focus on supporting the safety needs of the operational area or product line for which it was established to:
 - o Increase safety awareness and knowledge
 - o Identify opportunities for improvement
 - o Recommend improvement ideas to leadership team
 - o Share success stories
 - o Seek answers on safety matters
 - o Promote and recognize safe behaviors
 - o Set the example of safe performance
 - o Actively communicate safety

6.0 ROLES AND RESPONSIBILITIES

All B57I staff are expected to contribute to establishing and maintaining a safe and healthy working environment. Written procedures that identify program requirements include specific responsibilities. The following roles and responsibilities have been defined for implementing the program.

6.1 Executive Vice President B57I

- 6.1.1 Provide active leadership for effective implementation
- 6.1.2 Assume responsibility for the safe overall operation of B57I
- 6.1.3 Provide a safe and healthy working environment for B57I staff
- 6.1.4 Provide resources necessary to ensure continuous improvement

6.2 General Manager/Division Leaders

- 6.2.1 Ensure program implementation and compliance within the division
- 6.2.2 Take ownership of the safety program within their division

6.3 Vice President, B57I Operations & Systems Services

- 6.3.1 Provide S&H support to the Executive Vice President B57I
- 6.3.2 Oversee the Environment, Safety, Health and Quality Systems Management for B57I
- 6.3.3 Ensure Battelle staff are provided a healthy and safe environment

6.4 Vice President, ESH&Q Systems Management

- 6.4.1 Ensure implementation of Battelle and B57I policy
- 6.4.2 Provide S&H oversight, support and assessment to facilitate effective operations and identify regulatory compliance requirements to enable management to meet their responsibilities
- 6.4.3 Ensure development and management of ESH&Q plans and applicable programs
- 6.4.4 Establish and oversee operation of the Safety Steering Committee and establish Committee operating procedures

6.5 Line and Support Management

- 6.5.1 Implement safety and health programs within their respective organizations
- 6.5.2 Ensure staff engage S&H resources when the level of expertise required is beyond their knowledge
- 6.5.3 Ensure staff in their area of responsibility receive necessary training

6.6 Safety, Health and Emergency Response

- 6.6.1 Reports directly to the Vice President ESH&Q SM to provide subject matter expertise in the development, implementation and oversight of S&H plans and programs

- 6.6.2 Serve as a direct resource to ESTI management and staff to provide high quality technical support for implementing Safety, Health and Emergency Response programs.
- 6.6.3 Conduct audits and inspections to help contractors work and educate project staff on S&H to ensure a safe work environment.
- 6.6.4 Assist project teams in estimating and pre-planning for safe conduct of projects.
- 6.7 Staff
 - 6.7.1 Work safely at all times and maintain safe work conditions in accordance with safety procedures.
 - 6.7.2 Make suggestions for safety improvement.

7.0 INTERFACES WITH OTHER PROGRAMS

The S&H Management Program interfaces with the following programs and/or functions within ESTI to ensure comprehensive implementation of S&H requirements. Each of these interfaces helps to ensure ESTI's ability to conduct and deliver quality products and services that meet or exceed compliance with applicable regulations. These programs are designed not to overlap but to provide complete coverage of applicable regulatory requirements.

- Environmental Protection – ensure safe removal of hazardous waste from laboratories and identification of significant environmental impacts resulting from projects or operations.
- ESTI Quality Management Systems and Training – provide document control, records management, and safety training.
- ESTI Regulatory Compliance Management – ensure timely identification of new or changing regulatory compliance to facilitate integration into existing programs and procedures.
- Radiation Safety – provide review and oversight of projects and operations using radioactive materials.
- Medical/Health Services – provide medical response to injuries and illnesses occurring on site and establish health screening criteria for job eligibility.
- Shipping and Receiving – ensure proper shipment of hazardous materials and identification of hazardous materials upon receipt.
- Facilities – review design and construction of facilities and interface on facilities maintenance.
- Purchasing – establish and implement procurement procedures for hazardous materials and equipment.
- Proposals/Contracts – ensure significant S&H hazards are identified during the proposal stage to ensure resources are included in the project before award.
- Human Resources – thoroughly identify job requirements to select qualified and capable candidates and identify jobs requiring health screening prior to employment.

- Legal – review BSTD procedures (when appropriate) to ensure compliance and provide interpretations of regulatory or other requirements.

This plan is a high level document under which more detailed Safety and Health General (GPI), Specific (SPI) and Equipment Procedures (EP) define specific program requirements. In addition, Work Instructions (WI), Forms (FM) and Training Material (TM) may be developed to support the program and procedures.

8.0 METRICS FOR EVALUATING PROGRAM EFFECTIVENESS

Metrics will be used as indicators of program effectiveness. A limited number of high level metrics will be defined and presented to senior leadership as periodic indicators of performance. Metrics will be defined in procedures and work instructions. Information collected from these metrics will be used to develop and roll up to the high level metrics. These will include both leading and lagging indicators. Leading indicators include items such as employee safety training hours and safety committee participation by management. Lagging indicators include such items as OSHA, injury and illness data, regulatory citations or violations.

9.0 TRAINING

- 9.1 All new BSTD employees will receive a new employee safety orientation.
- 9.2 Once a new employee reports to his/her specific area, the responsible manager or supervisor is responsible for providing an orientation to the work area which will include basic safety items.
- 9.3 Additional safety training requirements may be identified in BSTD program plans created by the S&H organization.
- 9.4 Safety training requirements implemented to satisfy client requirements will be documented in project or product line procedures and documents.

10.0 PROGRAM ASSESSMENTS/AUDITS

- 10.1 Assessment and audits required for regulatory compliance will be specified in procedures and work instructions.
- 10.2 BSTD S&H Representatives will conduct facility walk-throughs of all active laboratory and non laboratory (receptionist working spaces) at least twice a year.
- 10.3 Areas undergoing facilities construction/renovation/demolition will be evaluated to determine appropriate safety requirements. The BSTD Risk Assessment Form for Renovation/Construction Work (see Section 12.8) focuses on safety review of facilities activities.
- 10.4 Office locations will be audited on an as needed or as requested basis. Selected office locations will be audited annually.

11.0 PROGRAM REVIEW

This program shall be reviewed every 2 years at a minimum.

12.0 ASSOCIATED PROCEDURES AND FORMS

The following documents are associated with this program.

- ICD-PP-003 ESH&Q Training Program
- HRS-MN-001 Human Subjects Research
- RS-MN-001 Radiation Safety Manual
- EN-PP-003 Environmental Management Plan
- SIH-MN-001 Safety and Industrial Hygiene Manual Documents
- SIH-FM-113 BSTI Risk Assessment Form for Restoration/Construction Work

APPENDIX A. SHH GUIDANCE for PROPOSAL WRITERS and PROJECT MANAGERS

Use of this checklist is not mandatory. Reviewing checklist contents prior to completing the ES&H Q Integrated Risk Assessment questionnaire during the proposal process may help in completing the questionnaire. In addition, the checklist may also be consulted prior to preparing project plans to help ensure all safety elements are addressed.

I. Creating/Proposal Steps

- A. Does the project or task involve unusual hazards such as:
- ☐ Hazardous chemicals/toxins, carcinogenic, pyrophoric, corrosive, etc.
 - ☐ Reactive or explosive chemicals
 - ☐ High pressures, e.g., pressure vessels operating above 15 psig
 - ☐ High temperatures, e.g., above 500 F
 - ☐ High electrical voltage/energy, e.g., above 240 V/80 amps
 - ☐ Other high stored energy operations, e.g., flywheels, springs, suspended weights, hydraulics
 - ☐ Hazardous structural tests
 - ☐ High structures including non-elevated work, ladders, and scaffolding
 - ☐ Confined spaces
 - ☐ Low-vision classes
 - ☐ Other non-ionizing radiation, e.g., EMP, microwaves, radar, etc.
 - ☐ Watercraft
 - ☐ Diving operations not at King Avenue
 - ☐ Aircraft
 - ☐ Biological, pathogenic or GHS/BSA work
 - ☐ Ionizing radiation, e.g., radionuclides, sealed/unsealed sources, radio equipment
 - ☐ Probable exposure of the public to above hazards
 - ☐ Providing a product or system with operating instructions and procedures to clients
 - ☐ Providing ES&H or regulatory recommendations to clients
 - ☐ Firearms, ammunition or weapons
 - ☐ Operating powered industrial vehicles
 - ☐ Power-actuated tools
 - ☐ Trenching/excavating
 - ☐ Working with animals

- B. Do any of the above (checked) items trigger a special review by one of the Columbia Safety Review Committees (see Appendix B)? If so, contact the committee representative.
 - C. Do any of the above (checked) items require an increase in time for reviews, training of staff, etc., additional equipment for protective devices or controls, or facilities for explosion proof wiring, ventilation, or large special space that would result in an increase of money or loading?
 - D. Do any of the above (checked) hazards result in unusual disposal or storage costs especially at the end of the project? Especially difficult items for disposal are PCBs, dioxins, mercury, asbestos, cyanides, radioactive sources, and radioactive wastes mixed with hazardous chemicals.
 - E. Submit ESH&Q Questionnaire when completing the Integrated Risk Assessment Process (proposal) if applicable.
- II. Pre-project/Pre-operation Stage – Use the following questions to help identify what could go wrong and may pose a safety hazard to operations once they are underway.
- A. Is equipment (e.g., gloves, masks, piping, machinery, etc.) designed and sized properly?
 - B. Does the project involve the use of machinery, such as forklifts, cranes, ladders, driving equipment, etc.? If so, are appropriate controls (i.e., procedures, training, etc.) in place?
 - C. Are other project hazards (e.g., chemicals, chemical products, electrical hazards, mechanical hazards, use of radioactive materials, etc.) involved?
 - D. Are documented safe work practices already exist for the hazards identified or do they need to be developed (Documentation of Safe Work Practices, Section 5.3.1)? Have documented safe work practices been reviewed by the ESH Representative?
 - E. Is appropriate emergency equipment (e.g., fire extinguishers, safety showers, electrical cut offs, ventilation, spill clean up kits, etc.) in place and serviceable based on the identified hazards and equipment use, available and in good working order?
 - F. Do identified hazards, or safe work practices, indicate the need for any of the following?
 - Properly trained and qualified personnel to use any equipment or machinery.
 - Properly informing staff of safe work practices, including emergency response.
 - Use of proper personal protective clothing and equipment.
 - Steps and procedures to minimize wastes and disposal costs.
- III. Project/Operational Stage
- A. Are periodic inspections necessary to ensure safe facilities (e.g., conducting monthly ESH inspections of the area(s), including checks of the fire extinguishers, breach boxes, eye wash, deluge showers, spill kits, etc.)?
 - B. Are safe work practices and procedures instituted to ensure they are being followed?
 - C. Are practices modified when inadequate or no open time exists?

- D. Are wastes disposed or regularly to minimize build up of hazardous chemicals and potential wastes?
- E. Is recurring training necessary for long projects?

APPENDIX B BSH SUBJECT MATTER EXPERT SAFETY REVIEW COMMITTEES

Biological Safety Committee

Reviews and approves all research activities and specific practices for handling biological materials including organisms at the biosafety level 3 (BSL-3) and Select Agents defined by 42 CFR 73.

Human Subjects Committee

Reviews all research activities in which humans are to be used as subjects for experimental procedures or treatment, and includes questionnaires that are to be used to sample opinions, test reactions, or collect other data from humans.

Institutional Biosafety Committee

Reviews all research activities and specific practices for constructing and handling recombinant DNA molecules. The committee will also review work with organisms and viruses containing recombinant DNA molecules.

Laser Safety Committee

- 12.1.1. Provides general oversight for the Laser Safety Program including reviewing accident investigations, recommending corrective actions, reviewing procedure modifications, approving installations and working on warning signs or labels specific to laser systems.

Pressure Vessel and Systems Safety Committee

Reviews pressure vessels and systems when research or project related units are designed to contain liquids or gases with the following pressure and volume parameters:

- Liquid-containing units (e.g., hydraulic) operating at 1000 psig (pounds per square inch gauge) with no regard to volume.
- Gas containing units (e.g., autoclaves) that operate at 5 psig minimum. A NP meet the pressure-volume factor (P x V) of 5 psig-cuft or greater. The P x V is calculated by multiplying psig by cubic feet.

For example: the following pressures and volumes meet or exceed the P x V of 5 psig-cuft: 5 psig @ 1 cubic feet (5 ft³ x 5 psig @ 0.5 ft³ = 40 psig @ 0.125 ft³ = 2000 psig @ 0.0025 ft³ or 4.32 cubic inches). Units operating below 5 psig, of any size, are not considered pressure vessels or systems by the Committee.

Radiological Safety Committee

The Radiation Safety Manual (BSM) includes a detailed list of projects and situations that require review by the Radiological Safety Committee. Any project or operation using radiological material should consult the BSM to determine if review is needed.

Risk Management Committee

Reviews all contractual or operational risks considered above normal. Reviews are performed during the procurement and proposal stage prior to making a contractual commitment through the Risk Assessment process.

REPORTING GUIDELINES

The **INCIDENT MANAGEMENT** is the on-line version. Before using a printed copy, verify that it is the most current version by checking the issue date of the on-line version on the **WFO/SAFE** website.

Incident Reporting Guidelines

This list is a guideline to determine whether an incident should be reported. In some cases, this list still leaves room for interpretation because it is difficult to state definitively which accidents/incidents should be reported. Contact the Safety and Health Representative with questions about what should be reported.

The following should be reported:

- Any occupational injury or illness
- Chemical or biological spills/releases that require emergency response or more than the individuals involved in the incident to clean up (e.g., calling upon a HAZMAT team to clean up a spill)
- Chemical or biological spills/releases that have the potential to adversely affect Battelle Staff Members, contractors, visitors, and/or the surrounding community
- Any unexpected fire
- Any unexpected explosion
- Near misses with the potential to cause adverse health effects, serious injury, death, or property damage
- Incidents that could reasonably be of interest to the media or surrounding community
- Incidents or accidents that cause property damage to Battelle- or client-owned property

ATTACHMENT 3

FINAL

**CONTRACTOR QUALITY CONTROL PLAN
FOR UNDERGROUND STORAGE TANK INTEGRITY TESTING AND
ADDITIONAL SITE ASSESSMENT ACTIVITIES AT SITE 14-SOUTH
FORMER NAVAL AIR STATION MOFFETT FIELD,
MOFFETT FIELD, CALIFORNIA**

Contract No. N68711-01-D-6009

Task Order No. 0017

DCN BATE-6009-0017-000

Prepared for

**BRAC PMO West
1425 Francis Road, Suite 900
San Diego, CA 92161**

Prepared by

**Battelle
Environmental Restoration Department
345 King Avenue
Columbus, Ohio 43260**

February 13, 2003

CONTENTS

FIGURE	18
TABLES	33
ABBREVIATIONS AND ACRONYMS	39
Section 1.0 INTRODUCTION	1
1.1 Background	1
1.2 Scope of Work	1
Section 2.0 PROJECT ORGANIZATION, RESPONSIBILITY AND POINTS OF CONTACT	1
2.1 Named/Project Manager	3
2.2 Quality Assurance Officer	2
2.3 Resident Officer In Charge Of Construction	3
2.4 Project Manager	3
2.5 Project Engineer	4
2.6 Field Team Leader	4
2.7 Project Quality Control Manager	4
2.8 Subcontractors and Vendors	5
2.9 Points of Contact	6
Section 3.0 DEFINABLE FEATURES OF WORK	7
Section 4.0 DRAWINGS AND SPECIFICATIONS	11
Section 5.0 INSPECTION PLAN	33
5.1 Coordination and Mutual Understanding Meeting	33
5.2 QC Meetings	33
5.3 Preparatory Phase Inspection	33
5.4 Initial Phase Inspection	34
5.5 Follow Up Phase Inspection	34
5.6 Completion Inspection	35
5.7 Inspection Documentation	35
Section 6.0 DOCUMENTATION	35
6.1 Contractor Quality Control Report	35
6.2 Conference Notes and Confirmation Notes	36
Section 7.0 NONCONFORMANCES	36
7.1 Nonconforming Items	36
7.2 Disposition	37
Section 8.0 REFERENCES	39

FIGURES

Figure 1. Project Organization Chart	2
Figure 2. Typical Flash Grade Construction Monitoring Worksheet	12

TABLES

Table 1: Project Team Member Contact Information.	iv
Table 2: Definable Portions of Work.	vi

ATTACHMENTS

Attachment 1: Delegation of Authority Letters	
Attachment 2: Forms	

ABBREVIATIONS AND A.C. CONTINUED

ADNA	Activity Hazard Analysis
CQC	Constructor Quality Control
DCN	Design Change Notice
DPW	definition/section of work
FGE	Field Change Request
FED	Federated Air Force
FWENC	Fort Worth Environmental Corporation
HSEF	Health and Safety Plan
EDW	emergency-derived waste
NAE	Naval Air Station
NASA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NCR	Nonconformance Report
OSHA	Occupational Safety and Health Administration
PGCM	Project Quality Control Manual
QA	quality assurance
QAO	quality assurance officer
QC	quality control
POCC	Principal Officer in Charge of Construction
PPM	Permitted Project Manager
SAP	Sampling and Analysis Plan
SHSO	Site Health and Safety Officer
SOP	Standard Operating Procedure
USACE	United States Army Corps of Engineers
UST	underground storage tank

Section 1.0 INTRODUCTION

This Site-specific Contractor Quality Control (CQC) Plan establishes the procedures and methods to be implemented for the field activities at Site 14 South, Foster Naval Air Station (NAS) Moffett Field, California.

1.1 Background

This site-specific CQC Plan is an appendix to the Addendum No. 2 to Site 14 South Corrective Action Plan and Associated Work Plan and will be submitted as an addendum to the Final Phase IIa Remedial Contractor Quality Control Plan (Phase IIa Plan) (Pioneer Wheeler Environmental Corporation (PWEAC) SOCs) which provides the overall framework and basic criteria for the implementation of quality control (QC) measures for Moffett Field. The organization chart for Site 14 South is shown in Figure 1.

1.2 Scope of Work

The objective of the fieldwork for this project is to perform integrity testing on underground storage tank (UST) systems and install additional monitoring wells that will be used in conjunction with the existing well network to adequately characterize the nature and extent of chemicals in groundwater. Implementation of the selected actions will result in an enhanced understanding of the conditions in groundwater at the site and, depending on the results, will be used to assess whether further action is necessary for groundwater or to develop a remedial approach that is technically appropriate to treat groundwater. Specific field activities will include installing seven additional monitoring wells and conducting groundwater sampling activities.

Section 2.0 PROJECT ORGANIZATION, RESPONSIBILITY AND POINT OF CONTACT

This section describes the organization and authority of project personnel including subcontractors. The organizational structure, functional responsibilities, levels of authority, and lines of communication have been established within the organization to ensure high-quality work. The project organization chart is provided in Figure 1. The responsibilities and authorities of the key personnel are described in the following paragraph.

The Naval Facilities Engineering Command (NAVFAC) Southwest Regional Project Manager (RPM) for this project is Mr. Wilson Dozier. Both Mr. Gary Monahan and Mr. David Smith are the on-site Resident Officers in Charge of Construction (ROCCC) responsible for the management, oversight of safety and quality assurance (QA) of field activities and Mani Arora is the Navy's Quality Assurance Officer (QAO).

The Battelle project manager is Mr. Chris Zimmerman. Mr. Ryan Wessell will serve as both the project engineer and the Project Quality Control Manager (PQC/M) and Mr. Robert Jansky will serve as the Field Team Leader and the primary Site Health and Safety Officer (SHEO).

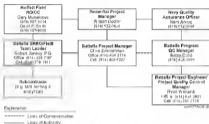


Figure 1 Project Organization Chart

2.1 Naval Project Manager

The NPM has primary responsibility with the Navy for day-to-day management of the project activities performed under the Work Plan, and for its successful completion. The NPM's duties and authority include:

- Performing project management for the Navy
- Ensuring that the project scope of work requirements are fulfilled
- Controlling the project cost and schedule
- Providing formal technical direction to the Battelle project team, as needed

2.2 Quality Assurance Officer

The QAO in the Navy representative will have primary responsibility for ensuring that the contract-required QA measures are in place and effective for the work performed. The QAO's duties and authority include:

- Reviewing and approving Sampling and Analysis Plans
- Providing Navy oversight of the Battelle QA Program
- Providing quality-related direction through the Contracting Assurance Program
- Providing technical and administrative oversight of Battelle surveillance and inspection
- Acting as point of contact for matters pertaining to generation and maintenance of quality of data
- Coordinating training on matters pertaining to generation and maintenance of quality of

that:

- Authorizing the suspension of project execution if QA requirements are not adequately followed
- Notifying the contractor and SHED of any work that is being performed in an unsafe manner

2.3 Resident Officer in Charge of Construction

The RCDC staff has the primary responsibility for providing on-site QA and safety oversight of construction. The RCDC staff member's duties and authority include:

- Verifying that all work has been completed per contract and technical specifications prior to final government acceptance
- Performing the quality assurance to ensure that the contractor's GQC manager is performing ongoing field inspection to verify that all work is in compliance with both contract and technical specifications
- Coordinate the review and signing work manifests with the ESAC Contract Site Office (CSO) or the purchaser's representative
- Notifying the contractor of any work that is being performed in an unsafe manner
- Interacting with the contractor's POCM on quality-related issues
- Reviewing and signing work manifests as the purchaser's representative
- Reviewing Contractor Daily Reports for completeness and accuracy
- Attending preparatory phase, initial phase, pre-final, and final acceptance inspections
- Attending weekly QC meetings

2.4 Project Manager

The project manager is responsible for the direction, execution, and successful completion of project tasks in order to achieve overall project goals. The project manager has responsibility for and the authority to direct all segments of the project including technical, construction, and administrative activities. Activities and responsibilities include the following:

- Coordinate work activities of subcontractors and Vendors personnel and ensure that all personnel adhere to the administrative and technical requirements of the project
- Monitor and report the progress of work and ensure that the project deliverables are completed on time and within project budget
- Monitor the budget and schedule and notify the client and the project manager of any changes that may require administrative action
- Ensure adherence to the quality requirements of the contract, project scope of work, and the QC Plan
- Ensure that all work meets the requirements of the technical specifications and comply with applicable codes and regulations
- Ensure that all work activities are conducted in a safe manner in accordance with the Site-Specific Health and Safety Plan (SSSP) Safety — Safety and Health Manual (SHM)

280-4.2 United States Army/Corps of Engineers (USACE), 280-4.3 and all applicable Occupational Safety and Health Administration (OSHA) regulations

- Serve as the primary contact between the Navy and BAE for action and information related to the work and make sure to include appropriate details and reports in the decision-making
- Coordinate preliminary resolution and completion of evaluations and acceptance regarding Nonconformance Reports (NCRs)

2.5 Project Engineer

The project engineer duties and responsibilities include the following:

- Ensure that engineering and design activities are technically adequate and consistent with standard procedures, appropriate codes, regulations and laws, design criteria, and project scope requirements
- Prepare project engineering work products including design criteria, calculations, drawings, specifications, equipment lists, technical support to supervisors, and engineering data
- Determine appropriate review requirements and ensure that reviews are completed
- Monitor the status of completion against the forecast schedule and notify the project manager of any potential changes as they are identified
- Maintain records as required by state professional engineering requirements including drawings, specifications, reports, calculations, and records of displacement errors

2.6 Field Team Leader

The field team leader reports to the project manager and is responsible for coordinating, directing, implementing, and supervising site construction activities. Specific duties of the field team leader include the following:

- Implementing construction activities in accordance with the Work Plan
- Directing field construction labor, labor support personnel, and subcontractors
- Addressing site access and site security
- Monitoring weather, vehicles, and equipment
- Coordinating and maintaining logistics of all components of on-site tasks including all personnel and equipment
- Preparing daily production and weekly status reports along with a monthly resource report and estimating future scheduling needs

2.7 Project Quality Control Manager

The PQCM is responsible for overall management of project QC and reports to the program manager. A personnel letter and resume of the assigned PQCM are provided in Attachment 1 respectively. The PQCM has the authority to stop work on site-related issues affecting the quality of the work performed and for affecting the correction of all nonconforming work. The PQCM will be on-site at all times during field activities. The duties of the PQCM are the following:

- Implement the three phases of control (preparatory, initial, and follow-up) to ensure that all prerequisites have been completed prior to the start of and during each applicable definable fraction of work (DFTF)
- Schedule and conduct QC meetings to review work status. Generate meeting minutes to document discussions and conclusions
- Monitor QC activities to ensure conformance with established policies, procedures, contract specifications, regional standards, agreed practices, and methods of quality coordination
- Be responsible for issuance and maintenance of the NCR
- Review that all on-site and off-site inspection, testing, and sampling are performed in accordance with the plans, specifications, and applicable codes
- Provide inspection and conduct an inspection before and sampling
- Review and maintain records of approved submittals, Design/Change Notices (DCNs) for construction activities and Field Change Requests (FCRs)
- Inspect material delivery, handling, and storage in accordance with technical specifications
- Update on-track drawings for revision installation
- Review and approve submittals and shop drawings and/or forward submittals or submittals only for approval
- Issue compliance notices on material, equipment, work in place, and workmanship
- Direct the removal of work, material, and equipment that is not in compliance with plans and specifications
- Immediately stop any requested work that does not comply with the specifications and drawings
- Inform the OCM of all proposed changes, resource problems, and any deviations from approved plans. This includes health and safety issues
- Inform the OCM and project manager of DCNs for document any discrepant conditions and forward the NCRs to the QC manager to obtain approval of recommended corrective action

3.3 Subcontractors and Vendors

Qualified subcontractors will be selected to provide various construction services for this project. The subcontractor is required to provide labor, material, and equipment necessary to conduct construction activities as directed by the project manager. Subcontractors and vendors will be required to conform to Baffle + QA/QC Plan and the requirements of all approved general area, technical specifications, and contract provisions.

The subcontractor's QC inspectors are responsible for field inspection of their construction and opening activities. Baffle personnel will monitor, oversee, and make as-of observations and inspections of work in progress to determine if the subcontractor's work is proceeding in accord with the QA/QC Plan.

Subcontractor personnel are responsible for maintaining a daily log of the project activities

they perform and for providing information needed to complete the Daily QC Report. All inspection records, including inspection reports, deficiency reports, and re-inspection of correction actions, will be documented.

2.8 Points of Contacts

Table 1 provides a list of the key Staffell, Henry, and regulatory project team members and for corresponding contact information.

Table 1. Project Team Member Contact Information

Title	Name and Contact Information
US Navy Remedial Project Manager (RPM)	William D. Ford NAVFAC Environment ERAC PMO West 1405 Fresno Blvd., Suite 100 San Diego, CA 92161 (619) 532-0822 william.d.ford@navy.mil
East and Defense Change of Construction (EDCOC)	Stacy Gary Munkreus EDCOC, Moffett Federal Airfield Hqg. 309 Moffett Field, CA 94035-0009 (650) 400-4004 stacy.munkreus@navy.mil
Construction Management Team (CMT)	David R. Smith EDCOC, Moffett Federal Airfield Hqg. 309 Moffett Field, CA 94035-0009 (650) 400-4004 David.R.Smith@navy.mil
Staffell Project Manager	Christopher Zimmerman Staffell Memorial Institute 300 Long Ave. Colchester, GH 42201 (814) 424-3775 www.cmi@staffell.com
Staffell Field Team Lead/ Site Health and Safety Officer (SHSO)	Elizabeth Jansky Staffell Memorial Institute 300 Long Ave. Colchester, GH 42201 (814) 424-7168 Mobile (814) 276-1313 www.cmi@staffell.com
Project Response/Project Quality Control Manager (PQCM)	Don Weirich Staffell Memorial Institute 300 Long Ave. Colchester, GH 42201 (814) 424-3700 Mobile (814) 300-2170 www.cmi@staffell.com

Title	Name and Contact Information
Water Resource Control Engineer	Michael E. Wells Regional Water Quality Control Board San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, CA 94612 (510) 422-3448 MWells@waterworks.ca.gov
US EPA Project Manager	Alex Lee EPA Region 9 15 Harrison Street, SFD 7.1 San Francisco, CA 94105 (415) 712-3040 Lee.Alex@epa.gov

Section 1.6 DEFINABLE FEATURES OF WORK

The DFWs identified for the Site 14 South groundwater characterization effort consist of the following activities:

- Mobilization
- Underground storage tank (UST) piping integrity testing*
- Scan, locate and mark utilities*
- Installation of monitoring wells*
- Well development*
- Equipment decontamination
- Investigation derived waste (IDW) transport and disposal *
- Location survey of groundwater monitoring wells*
- Groundwater sampling
- Demobilization

* Denotes a task that will be completed by a third-party contractor

Table 2 presents an overview of the three-phase (preparation, initial, and follow up) implementation process that will be implemented to ensure the quality of the activities.

Table 2. Defensible Features of Work

Preparation Inspection	Initial Inspection	Follow-up Inspection
(Safety, Environmental, Health & Welfare)		
<ul style="list-style-type: none"> Verify that person with resources have been approved Review that all site personnel, including subcontractors, have submitted health and safety and qualification documentation to owner/contract Verify that emergency response is established in California Verify that a local personnel who represent city-state government property to perform project work has been submitted to the NRCOC Verify that the NRCOC has been notified Verify that the Underground Service Alert has been satisfied Review project schedule of events and applicable go/no go in the Updated Site 14 South Connection Action Plan and Associated Work Plan Review existing utility drawings for areas where work will take place and ensure that these drawings are provided to the utility leading contractor Review safety requirements with appropriate personnel Review the Activity Hazard Analysis (AHA) for the activity 	<ul style="list-style-type: none"> Verify that the gas pipeline survey is being performed in accordance with procurement documents and the Site 14 South Connection Action Plan and Associated Work Plan Verify that the surveyor is using the correct equipment/system to locate utilities Verify that the gas pipeline survey is performed in the correct location Verify compliance with the SHSP and local AHA 	<ul style="list-style-type: none"> Inspect and verify that the gas pipeline survey was performed in accordance with procurement documents and the Site 14 South Connection Action Plan and Associated Work Plan Verify that the surveyor knew the correct equipment/system to locate utilities Verify that the gas pipeline survey was performed in the correct location Verify that construction logs were in place for the duration of project activities
Integrity Testing of Utilities and Associated Piping		
<ul style="list-style-type: none"> Confirm schedule and scope of testing is with the PCOC and the Project Area contract and Specifications (PS&S) Review procurement documents and applicable portions of the Updated Site 14 South Connection Action Plan and Associated Work Plan Review testing requirements with appropriate personnel Review the AHA for this activity 	<ul style="list-style-type: none"> Verify that the integrity testing is being performed in accordance with procurement documents and the Updated Site 14 South Connection Action Plan and Associated Work Plan Verify that the subcontractor has properly calibrated all leak testing equipment Verify compliance with the SHSP and local AHA 	<ul style="list-style-type: none"> Inspect and verify that the leak testing was conducted in accordance with procurement documents and the Updated Site 14 South Connection Action Plan and Associated Work Plan

Table 3. Definable Features of Work Summary

Preparation Inspection	Initial Inspection	Follow-up Inspection
<p align="center">Monitoring Well Construction, Well Development, and QA/QC Review of well/Drillrig</p> <ul style="list-style-type: none"> On site to observe schedule and ensure activities in work the RCRC and PACA Review procurement documents and applicable portions of the Updated Site 14 South Coast Area Plan and Associated Work Plan Verify that all necessary permits have been approved by PACA Review current permit, Allowance and Limitation Verify that Drilling and Review Alerts have been initiated as necessary and all the site plan site any adverse situation Verify that required equipment and materials including the drill rig and a Class 2 or higher drill rig are on hand to conduct work in accordance with project documents Review the lower slope section to confirm correct and appropriate equipment and verify that water is not being used unnecessarily and in place Review working site safety measures and status needed by geophysical construction Verify RCRC and PACA are in compliance Review the AHA for the activity 	<ul style="list-style-type: none"> Verify that the rig and materials necessary can be set up in accordance with project documents and the Updated Site 14 South Coast Area Plan and Associated Work Plan Verify that boring logs and well construction documents are completed for each boring and that PD meetings are recorded in the Field Logbook Verify that the construction procedures are properly used Review compliance with the RCRC and AHA Verify that the activities are being photographed 	<ul style="list-style-type: none"> Inspect and verify that all monitoring wells were installed in accordance with project documents and the Updated Site 14 South Coast Area Plan and Associated Work Plan Verify that the rig logs have been completed in each boring and that PD meetings have been recorded in the Field Logbook Verify that contractor has provided daily logs and field notebook used Verify that the logs have been completed upon using and properly utilized sections with necessary equipment, as appropriate Verify proper maintenance of wells
Monitoring Well Survey		
<ul style="list-style-type: none"> On site to observe schedule and ensure activities in work the RCRC and PACA Review procurement documents and applicable portions of the Updated Site 14 South Coast Area Plan and Associated Work Plan Verify that survey is in accordance with Allowance Review working drawings that show pertinent survey landmarks and comments for areas where work will take place and ensure that these drawings are provided to the survey contractor Verify that survey equipment and be adequate to set in the field Review survey requirements with appropriate personnel Review the AHA for the activity 	<ul style="list-style-type: none"> Verify that the land survey is being conducted in accordance with project documents and the Updated Site 14 South Coast Area Plan and Associated Work Plan Verify that the survey is in accordance with the site plan and the survey is being conducted in accordance with the project documents Verify that the land survey is performed in the correct location Verify compliance with the RCRC and AHA 	<ul style="list-style-type: none"> Inspect and verify that the land survey was conducted in accordance with project documents and the Updated Site 14 South Coast Area Plan and Associated Work Plan Verify that the survey is being conducted in accordance with the site plan and the survey is being conducted in accordance with the project documents Verify that the land survey is performed in the correct location

Table 3. Definable Features of Work Summary

Preparation Inspection	Initial Inspection	Following Inspection
<p><i>Groundwater Monitoring and Management Oversight Function</i></p> <ul style="list-style-type: none"> On site schedule and compare to location with the RODG and RASs. Review applicable portions of the Upland Site 14 South Connector Action Plan and Associated Work Plan, including the Sampling and Analysis Plan (SAP) Review the base map documents to find location 1 and verify that wells are also in 1d needed from a base map and a plan. Verify that required equipment and materials including sample maintenance pumps, PIDs, and decontamination equipment are on hand to conduct routine monitoring with project documents. Review sample storage preservation procedures. Verify coordination of sample delivery dates and times with the project director. Review sample documentation handling and shipping procedures. Verify that the Upland Site 14 South Connector Action Plan and Associated Work Plan and SAP have been read and understood by work field workers. Review the A-MMSD to risk category. 	<ul style="list-style-type: none"> Verify that sampling activities are being conducted in accordance with the Upland Site 14 South Connector Action Plan and Associated Work Plan and SAP. Verify activities are in progress monitoring sampling equipment. Verify that appropriate containers and sample preservation are used. Verify proper handling, packaging, and shipping of samples. Verify equipment decontamination procedures. Examine a plan with the SAP and with A-MMSD. Verify that site activities are being photographed. 	<ul style="list-style-type: none"> Inspect and verify that the sampling activities were performed in accordance with the Upland Site 14 South Connector Action Plan and Associated Work Plan and SAP. Verify that the information used on the sample containers is consistent with information presented on the field logbooks and chain-of-custody form. Verify sample packaging to risk project. Verify that the chain-of-custody form has been filed in the laboratory. Verify that the project samples with the project plan are. Verify proper management of waste.

Section 4.0 DRAWINGS AND SPECIFICATIONS

The primary construction component of the proposed fieldwork involves installing seven monitoring wells at various depths throughout the site. A general construction drawing for the proposed monitoring well installation has been provided in Figure 2. Upon completion, a final as-built well construction drawing will be submitted for each monitoring well installed. All monitoring wells will be installed in accordance with ASTM Standard D 3052-04 (ASTM 2004).

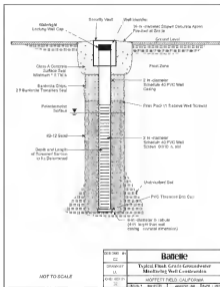


Figure 2 Typical Fresh Grade Groundwater Monitoring Well Construction

Section 3.0 INSPECTION PLAN

This section discusses the Deliverable Portions of Work (DPWs) for all field activities including those of subcontractors and suppliers. On inspection process, and the required meetings to ensure compliance with the contract. The DPWs establish the measures required to verify both the quality of work performed and compliance with specified requirements and include inspecting materials and workmanship before, during, and after each DPW. The DPWs for this project are identified in Section 3.1 and listed in Table 2.

Project/Inspector/Quality Control (QC/QC) includes implementing the following three control phases for all aspects of the work specified:

- *Proprietary phase*
- *Initial phase*
- *Follow up phase*

3.1 Coordination and Mutual Understanding Meeting

Prior to starting site work, the Project/Quality Control Manager (PQCM) will conduct a teleconference with the Resident Officer in Charge of Construction (ROICC) to discuss the quality control (QC) program required by this contract. The purpose of this meeting is to develop a mutual understanding of the QC details including those to be used, identification of on-site and off-site work, and coordination of the contractor's meeting events, production, and the PQCM dates with the ROICC. Minutes of the meeting shall be prepared by the PQCM. This meeting may be held in cooperation with other meetings (i.e., pre-construction meeting).

3.2 QC Meetings

After the start of field activities, the PQCM will conduct QC meetings as requested by the ROICC. The meetings will be held at the project site and will be attended by the ROICC, PQCM, and the field team leader. The following shall be accomplished at each meeting:

- Review the minutes of the previous meeting
- Review the schedule
- Review the status of milestones
- Resolve QC and production problems
- Review safety issues, Activity Hazard Analysis (AHAs), and safety concerns
- Address items that may require revision to the Project/QC Plan.

3.3 Proprietary Phase Inspection

The PQCM will conduct proprietary phase inspections prior to starting DPW listed in Table 2. These inspections shall include:

- A review of each paragraph of applicable specifications
- A review of the contract plans, drawings and requirement

- A check to verify that all materials and/or equipment have been tested, calibrated, and approved.
- A check to verify that permits have been made to provide required material.
- Inspection and testing.
- A re-orientation of the work area to verify that all required preliminary work has been completed and is in compliance with the contract.
- A physical examination of required materials, equipment, and sample work to verify that they are on hand, conform to approved shop drawings or submitted data, and are properly valued.
- A review of the agency rule AIAAs to verify safety requirements are met.
- A discussion of procedures for constructing the work, including required deliverables.
- Documentation of construction tolerance and workmanship standards for that phase of work.

The project manager, NRC/RTM, and EORCC shall be notified at least 2 working days in advance of each preparatory phase activity. This phase shall include a meeting conducted by the PQCCM and attended by the field team leader.

3.4 Initial Phase Inspection

An initial inspection will be performed at the beginning of a DPM and will include:

- A check of preliminary work to ensure that it is in compliance with contract requirements.
- A review of the Inspection Checklist documenting results of the preparatory meeting.
- Verification of full contract compliance, including required material inspection.
- Establishment of the required level of workmanship and verification to ensure that work meets minimum acceptable standards.
- Resolution of all differences.
- A check of safety requirements to include compliance with and updating of the State-Specific Health and Safety Plan and AIAAs.
- A review of the AIAAs with project personnel.

The project manager, NRC/RTM, and EORCC will be notified at least 2 working days in advance of any initial phase activity. The PQCCM will document initial inspections for each area using the Initial Inspection Checklist and attaching it to the Daily QC Report. The exact location of the initial phase inspection will be indicated for future reference and compared with follow-up inspections. An initial phase inspection will be conducted each time a new crew arrives on-site or any time accepted or specified quality standards are not being met.

3.5 Follow-Up Phase Inspection

During the completion of a particular work feature, follow-up inspections will be conducted to ensure continued compliance with contract requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed on each particular feature. Each follow-up inspection will be documented on the Follow-Up Inspection Checklist, which will be attached to the

Daily QC Report. A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase. Any deficiencies will be corrected prior to starting additional phases of work or will be identified on a Contractor Minimum Threshold Item List of items that do not conform to the specified requirements or are incomplete.

5.4 Completion Inspection

The PQCM will conduct a detailed inspection when all of the work was deemed to be complete. The RBOCC EUM and RBOCC QA may also participate and will be notified in advance of the inspection date. The work will be inspected for conformance to plans, specifications, quality workmanship, and completion. The PQCM will prepare an itemized list of work not properly completed, deficient workmanship, or work that does not conform to plans and specifications. The list will also include outstanding administrative items, such as record file build drawings. The list will be included in the QC documentation and referred to the project manager following the inspection and will specify an estimated date for correction of each deficiency. The completion inspection will be documented on the Completion Inspection Checklist and attached to the Daily QC Report.

5.5 Inspection Documentation

The PQCM is responsible for the maintenance of the inspection records. Inspection records will be legible and clearly provide all necessary information to verify that the items or activities inspected conform to the specified requirements or in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the RBOCC. All inspection records will be made available to the Navy.

Section 6.0 DOCUMENTATION

Preparation, review, approval, and revision of documents affecting quality will be controlled to the extent necessary to determine that the documents meet specified requirements.

6.1 Contractor Quality Control Report

The Project Quality Control Manager (PQCM) is responsible for maintenance of current records of quality control (QC) operations, activities, and tests performed, including the work of subcontractors and suppliers. The records will include logs documenting that QC activities and tests were performed. A Daily Contractor Quality Control (CQC) Report will be completed by the PQCM to document construction activities covered by the Project QC Plan. The document will include the following:

- Control methods (structural) and their area of responsibility
- Operating equipment, with hours worked, idle, or down for repair
- Work performed, including crew location, time, place, and by whom
- Test and/or control activities performed with results and references to Standard Operating Procedures (SOPs) (plan requirements, including the control phase [preparatory, initial, follow-up] and deficiencies taking with corrective action)
- Material used with statement as to its acceptability and storage

- Submittals received with contract reference by whom, and action taken
- Official surveillance activities including actions taken
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given/received and conflicts in place order/SOPs
- Contractor's verification statement
- Site emergency/escape directions from place, delineation, and location

6.2 Conference Notes and Confirmation Notes

In addition to other required documentation, the PQCM is responsible for taking notes and preparing the reports of all conferences. Conference notes will be typed and the original report furnished to the Navy within 5 days after the date of the conference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include the following:

- Date and place the conference was held
- List of attendees including name, organization, and telephone number
- Written comments presented by attendees attached to each report with the conference action noted: "A" for an agreed upon comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn, and "E" for a comment that has an exception noted
- Comments made during the conference and decisions affecting criteria changes
- Conference notes that represent the written comments

The project manager is also responsible for providing a record of all discussions, verbal discussions, telephone conversations, and so forth in which he/she personnel and/or subcontractors participate on matters relating to this contract and work. These records, entitled "Confirmation Notes," will be maintained separately and will fully identify participating personnel, subject discussed, and any conclusions reached. The project manager or his designee will forward a reproducible copy of the confirmation notes to the Navy NPM and PQCM within 5 working days.

Section 7 • NONCONFORMANCES

The Project Quality Control Manager (PQCM) documents any work or materials not conforming to the technical specifications or project contract requirements on a Nonconformance Report (NCR). The NCR will detail the nonconforming condition, the recommended corrective action(s), and the disposition of the current re-activities. Qualified representatives from engineering, quality assurance (QA), and construction will review the NCR and either accept or reject the recommendation of corrective action or disposition. The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified by quality control (QC) inspection staff and PQCM. Upon accepted satisfaction of selected nonconformances, NCRs for each item will be completed.

7.1 Nonconforming Items

Items classified as nonconformances will be documented. Copies of completed NCRs will be

sent to the Resident Officer in Charge of Construction (ROCC). If correct or actions are insufficient, resolution cannot be reached, or results of prior work are inadequate, work may be stopped. A "Stop Work Order" will be issued by the PQCM. If there is a disagreement between the PQCM and the project manager, the difference will be brought to the attention of the program manager until resolution is achieved.

The contents of the "Stop Work Order" will be described in detail on a "Breach Notice List" in addition to the NCR, to allow evaluation of the problem(s) and proper corrective action(s). Work will not continue until the "Stop Work Order" has been accepted by the individual who authorized it.

The nonconforming items will be controlled to prevent inadvertent use. All items noted as nonconforming will be clearly identified and segregated from acceptable items when practical.

7.3 Disposition

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include reworking, replacing, rejecting, or accepting. Implementation of the disposition may be done in accordance with the original procedural requirements: a specific instruction, or a Field Change Request (FCR). Site personnel shall document changes to the approved plans in the field through the FCR form. Also necessary, the following information will be documented on the FCR form:

- Project name
- Contract Work Order number
- FCR number
- Documents to which a change is requested (including revision number of applicable)
- Description of the item or condition for which the change is requested
- Reason for the change
- Recommended disposition
- Cost and schedule implication of the change, if any
- Approval of discipline if changes involve sub-critical items or that discipline
- Approval of the PM, Site Supervisor, Project/Environmental Safety Manager, and QC/M

Upon detecting a nonconforming condition, the PQCM will immediately take corrective action.

Section 4.8 REFERENCES

- American Society of Testing and Materials (ASTM). 2004. *Standard Practice for Design and Installation of Ground Hole Retaining Walls*. ASTM Standard D 5852 – 04. June.
- Baker Wheeler Environmental Corporation (PWSOC). 2000. *Final Base Wide-Contour Quality Control Plan*. Moffett Federal Airfield, Moffett Field, California. August 17.
- United States Army Corps of Engineers (USACE). 2001. *Safety & Health Requirements Manual*. 305-1-1. November.